MARCH, 1951

RAILWAY Mechanical and Electrical Engineer

24 RAILWAY AGE June 17, 1937

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The freight car truck is yet to be built that cannot be made a better truck through the application of Unit brake rigging.

UNIT TRUCK

MARCH, 1951

RAILWAY Mechanical and Electrical Engineer

Founded in 1832 as the American Rail-Road Journal.

VOLUME 125 No. 3

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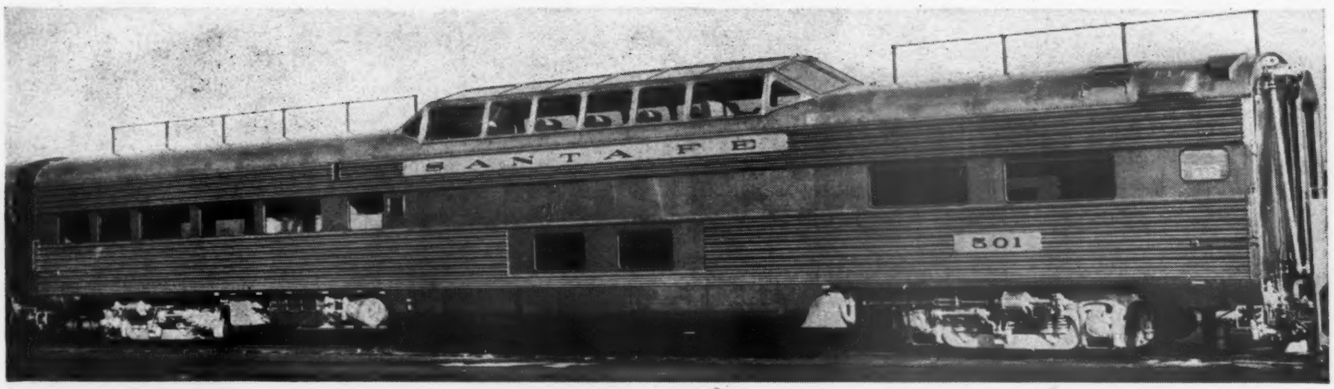


The dome-lounge car

Dome Cars for the "Super Chief"

Distinctive Turquoise Room proves highly attractive additional feature in car for the Santa Fe

THE Atchison, Topeka & Santa Fe has recently placed in service complete new car equipment for the "Super Chief," including bedroom-roomette cars, drawing room-compartment-bedroom cars, observation-sleeping cars, dome-lounge cars and diners. These cars were constructed by the Pullman-Standard Car Manufacturing Company and the American Car & Foundry Co.

The dome-lounge cars, built by Pullman-Standard, comprise a completely new design including a Turquoise Room seating up to 13 which may be arranged for private dining parties, as an outstanding new feature. Other accommodations in the car include the lower cocktail room and bar with a seating capacity of 10, main lounge room, seating 18; parlor-observation dome seating 16; and a private writing desk room, or five rooms in all. The total seating capacity is 57.

The Turquoise Room is notable for distinctive silver and gold decorative treatment consisting of vinylite on the side and end walls with accordion-type sliding doors covered with the same material in harmonizing color. These doors may be left open, or closed for privacy, whichever suits the occasion. Golden-tint plate mirrors line the side wall above the banquette seating arrangement. Gold-colored-texture draperies are used at the windows and door portieres at one end of the room segregating it from the lower cocktail lounge. The tables can be arranged for cocktail service or dining.

The lower cocktail lounge is modernistic in design. The front of the bar is covered with a vinylite material in a cherry red of quilted design, applied by the use of brass-colored oval-shaped snap-on mouldings, typical of the southwest. A large portion of the side wall is covered with flesh-tinted mirrors which add to the beauty and warmth of the room and give a feeling of spaciousness.

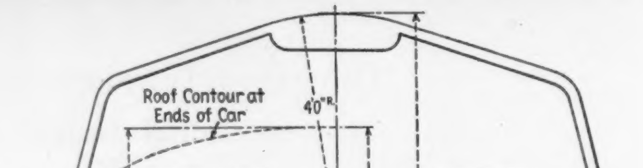
The large main lounge has a new and unique arrangement of furniture. A diagonal seat for card playing with pull-up chairs is located at the forward end of the room. Done in colors of the Southwest, this room also includes two modern sofas along with several lounge chairs and built-in seating units, all of which are arranged to give passengers an unobstructed view of scenery through opposite windows.

The color scheme used in the main lounge room is also carried out in the dome which utilizes for the first time revolving parlor type seats giving maximum comfort and enabling passengers to view the scenery from every angle.

Dome Car Construction

The cross section outline and floor height of the dome-lounge car is the same as standard lightweight passenger

The seats in the dome (above) are the revolving type. At the right is a cross-section of the dome-lounge car



cars, except that at approximately the center of each car a 2-ft. high dome is added, which raises the roof at this portion of the car to 15 ft. 6 in. above the rail. For the length of the dome compartment, the cars have two levels, the upper level being the floor in the dome, and the lower level depressed into the underframe. The passageway around the lower level is intermediate in height, being connected to the floor level at the ends by means of ramps.

The car is 86 ft. 6 in. over coupler pulling faces and has a distance between truck centers of 61 ft. The height from top of rail to top of floor at the ends is 4 ft. 3 in.; top of rail to top of floor at the lower level room, 23 1/16 in.; top of rail to top of floor at the dome passageway, 8 ft. 8 in.

The general construction of this car employs low-alloy high-tensile steel of riveted and welded design for the car-body framing. Exterior sheathing is of stainless steel with flat surfaces between the windows and on the ends, while fluted design is applied at the letterboard and below the windows.

The underframe is of welded high-strength low-alloy steel. The center still between bolsters up to the lower level under the dome consists of two A.A.R. Z-26 sections, 31.3 lb. per ft., with top flanges welded together continuously. The center sill is welded behind each bolster to a separately-constructed built-up draft sill. At the lower level under the dome, the Z-26 center sill stops and is attached to heavy Z-sections placed crosswise of the car. These beams are connected at the ends (or side posts)

to box-section members which serve as the center sill for this portion of the car.

Construction at the depressed floor under the dome consists of four crossbearers, one located at each end of the depressed portion of the car and two equally-spaced between. End crossbearers are channels, 6 in. by 2 in.; center crossbearers are 6-in. by 4-in. I-sections. At the sides of the car the crossbearers are fitted and welded to built-up I-sections placed longitudinally and extending the full length of the depressed portion. Pressed Z-floor beams (6 in. deep) are placed longitudinally, fitted and welded to the crossbearers.

Superstructure Details

Welded girder-type construction of high-tensile low-alloy steel is utilized in the superstructure. The 2½-in. side sill angles are continuous the full length of car. Side posts, belt rail and window header are 3-in. Z-bars, 2.55 lb. per ft. Side plates consist of two sections for the length of the car.

Side sheets are .075-in. high-tensile low-alloy steel for letterboard and girder sheet, spot-welded to framing members and reinforced with .030-in. corrugated stiffeners spot-welded to the inside surfaces between posts. The entire roof framing including the dome is of welded high-tensile steel. Roof sheets are stainless steel spot-welded to carlines and purlines and riveted to side plates.

The roof over the dome compartment is almost entirely glazed with flat glass sealed units, except for suitable structural members for supporting these glass units. These members are designed so that the glass units can be applied from outside the car and the width of the members is kept at a minimum to give as much glassed area as possible.

Glass for the dome consists of double Thermopane units, supplied by Libby-Owens-Ford. The outside light of each unit is ¼-in. heat-absorbing polished plate glass and the inside light uniform ½-in. laminated safety polished plate glass.

The entire floor area is covered with a lightweight composition applied to Keystone sheets of zinc grip steel resting upon pressed Z low-alloy high-tensile stringers.

End Equipment—Insulation

Couplers are of the Americal Steel Foundries' controlled-slack Type E, made of high-tensile steel, as are the coupler yokes. Draft gear are Miner Type A-4X-B, and the lower buffing mechanism, Miner Type B-18X. The buffers are a built-up design having side stem spring and center stems and being carried on the end structure by adjustable extension rods. A Fowler improved buffer is also installed. Morton end diaphragms are of the two-fold U-shape type. In conformity with Santa Fe practice, no use is made of contour closures.

The car bodies are insulated with Johns-Manville Type A Stonefelt 3 in. thick having asbestos flame-proof sheathing on both sides, and applied to the sides, ends, roof and top of the false floor. Stainless steel wiring is used to hold the insulation in place except in the floor. Sides, ends, roof and sub floor have Insulmat sprayed on ¼ in. thick (dry measurement) for sound-deadening purposes.

Electrical Equipment

The electrical system is derived from a 10-15 kw. Frigidaire-type diesel alternator unit, mounted underneath the car and consisting of two direct-connected alternators. Alternator 1 supplies 10-kw. 114-volt current for lighting, small appliances and the evaporator blower motor, and Alternator 2 supplies 15-kw. 210-volt current for the air-conditioning system. Each car is supplied with a 150-gal. heavy-gauge steel tank applied underneath the car for storage of fuel for the diesel engine. Electric power for emergency lighting and engine starting is supplied from a 32-volt storage battery, which is charged from a direct-current exciter belted to the main engine drive shaft.

The heating system utilizes Vapor narrow unit-fin radiation. The equipment includes a vertical-type solenoid valve, latest-type loop equipment and zone control heating arranged with individual circuit for each portion of the car on the various floor levels.

The main trainline is of 2½-in. extra heavy steel pipe, insulated with Johns-Manville asbestos sponge-felted pipe covering and protected with an outer covering of .040-in. galvanealed steel.

Air conditioning is of the Frigidaire type, 10-ton capacity, split into two 5-ton units applied overhead in car body which completely air conditions the car, including the dome. The air is distributed by air ducts of .030-in. thick Everdur, insulated with 1-in. thick Stone felt Type A insulation cemented to the ducts and all joints sealed with tape. The circulating air grille is Barber-Colman multi-louvre register with lint screen. Fresh air filters are Farr type. The car is also equipped with four Dorex absorbers.

Westinghouse air brake equipment is the modified H. S. C. control with a generator-type speed governor, and arranged for future application of electro-pneumatic brake control. The air reservoirs are of lightweight steel and the brake pipe is hard copper tubing with sweated copper fittings. For connection to valves and reservoirs, flange fittings are used, with threaded connections to facilitate disconnecting. A Peacock hand brake, furnished by the National Brake Company is of the pumphandle type, applied at the dummy end of the car.

The windows in this car are equipped with Adams & Westlake aluminum breather type sash glazed with Pittsburgh Plate Glass Company's safety glass on the inside and clear plate glass on the outside.

Trucks

The trucks are General Steel Castings four-wheel type with 9-ft. wheel base and I-beam equalizers. They are equipped with bolster anchors, inverted center plates and bolster roll stabilizers, Houdaille vertical and lateral shock absorbers, brake beam stabilizers, Sante Fe standard side bearings and truck-mounted brake cylinders. The frames and bolsters are of cast nickel steel.

The wheels are of Standard Steel Works manufacture, 36½ in. diameter with A.A.R. cylindrical treads, mounted on 6-in. by 11-in. straight center axles, machined all over and having ground journal surfaces. Timken roller bearings and boxes are fitted on all axles. Four journal boxes are arranged for Westinghouse decelostats and one for speed governor control. All are equipped with hot box odor alarm.

Double coil springs are furnished by the American Steel Foundries for both bolster and equalizer springs. The Simplex unit-cylinder clasp brakes are designed to develop a total braking power 250 per cent of the lightweight of the car at 100-lb. cylinder pressure.

The dome-lounge car has an average total weight of 154,958 lb., of which 41,850 lb. are in the trucks. The diner has a total weight of 143,514 lb. The trucks of this car weigh 41,750 lb.

Controls for Heating and Air Conditioning*

An insight into the specific problems of train heating and air conditioning and the equipment involved for proper functioning

By Norman O. Kirkby†

THE FIRST passenger diesel locomotive presented a major problem in heating. The steam locomotive had been an almost inexhaustible source of heat, limited only by pressure and the size of the steam distribution lines. While a large amount of heat was present on the diesel and wasted to the atmosphere through the radiators and exhaust manifolds, no practical method of harnessing this heat was, or is known, within the limitations of size and weight restrictions. As all railroad cars were heated by steam, some source of steam was necessary.

It was necessary to find a new method of generating steam and an entirely new concept of steam generation resulted in the first successful straight through steam generator. Such a generator had definite advantages over a conventional boiler. Since no water level is maintained and no water drums are used, the size of the water containing portions may be reduced to a minimum, consistent with high heat exchange practice. The small volume of water gave other advantages of safety. The mass of water in the coils at or near vapor temperatures is so small that a complete rupture of the coil may occur without any possibility of a steam explosion. Since cubical size was extremely limited, combustion volume was likewise limited and heat release per unit of combustion volume had to be increased greatly over standard practice. It was felt that such intensity could be achieved by burning in a high pressure chamber. Heat release on these generators is in the neighborhood of 1,000,000 B.t.u. per cubic foot of combustion space, approximately twenty times normal practice. A typical steam generator in use on diesel locomotives has a normal rating of 4,500 lb. of steam per hour and is capable of a maximum output of 4,800 lb. of steam per hour.

These generators are continuous coil type steam generators, down fired with the same diesel fuel as is used on the power engines. Sizes range from 500 lb. of steam per hour to 4,800 lb. of steam per hour at varying pressures from 75 to 300 lb. per square inch. Steam quality is in the neighborhood of 99.8 percent. Feedwater is pumped by semi-high speed triplex pumps to a water pressure regulator which bypasses water when steam pressure is within the control range. The water flows from the water pressure regulator to a hydraulic servo mechanism that proportions fuel and air to the volume of water passing through the control. Here then is the major difference between a steam generator and conventional boiler. Water must be fed to the generator in exact accordance with steam demand, and practically all water entering the generating coils must be converted to steam in a single pass. No water level is maintained, therefore, flow controls must be used to regulate water, fuel and air. The volume of water flowing through the water portion of the servo control positions an oil valve which operates the hydraulic mechanism. Hydraulic pistons position a double cam plate to increase or decrease fuel and air. The double cam plate through a sleeve valve balances the hydraulic pistons to bring the system to equilibrium. The water then enters the steam generating coils where it is converted to steam. Any excess water is removed by a centrifugal steam separator to insure dry steam. The excess water, traveling at high velocities through the coils, carries the scale forming sludge into the separator where it is separated and wasted to the ground by automatic periodic blowdowns.

Atomization is by compressed air and a high pressure fan furnishes combustion air. A steam temperature limit control meters oil to the burner nozzle if lack of water causes superheating. Standard safety controls are used and A.S.M.E. practices and codes are observed throughout the manufacturing procedures. Thermal efficiencies are approximately 82 percent.

The rules governing enginemen and firemen prohibit the fireman from leaving the cab of the locomotive when the train is in motion. Therefore, all controls must be entirely automatic and in addition, remote alarms are used to indicate any failure of the generator or its appliances. Shut down of the unit upon arrival at terminals is accomplished by remotely operated valves which shut off the main steam line and, in turn, cause the generator to reduce its output to zero.

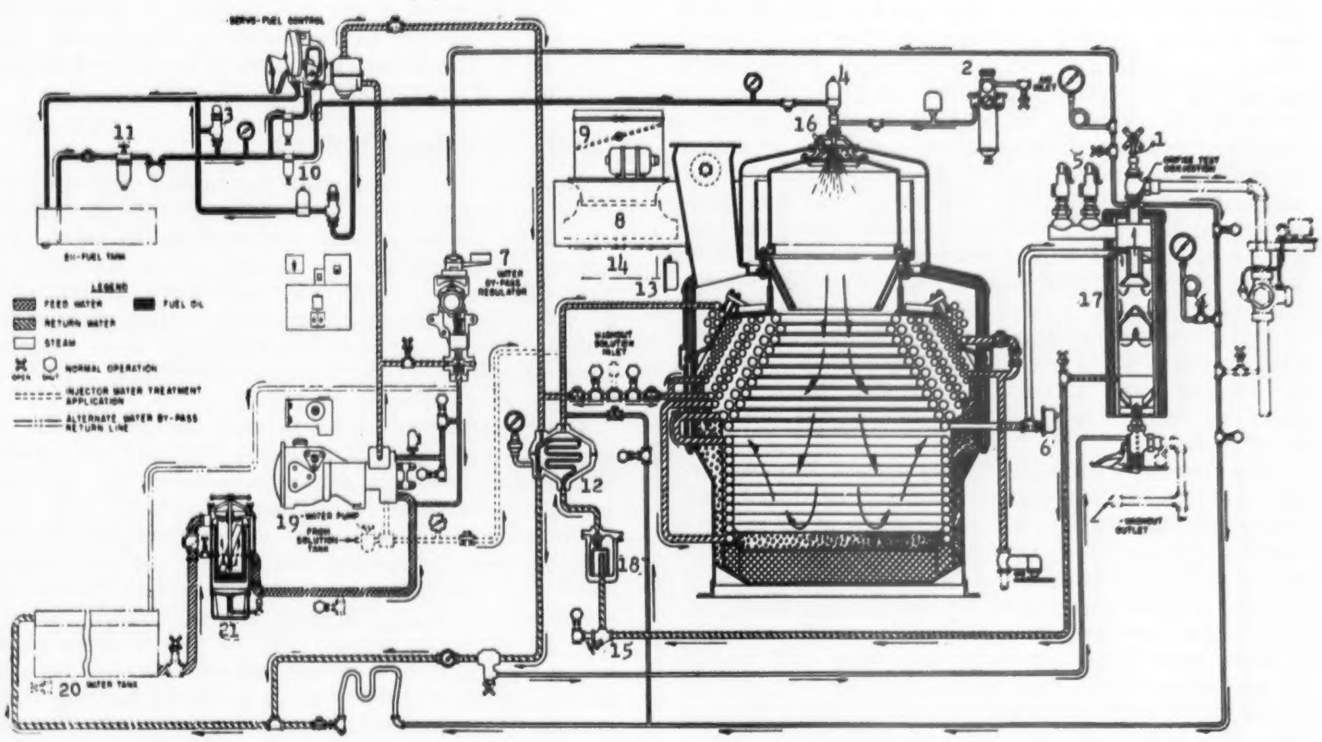
Maintenance periods may well be irregular and at extended periods, some railroads covering 5,000 miles of operation before bringing the locomotive into a terminal for maintenance. For this reason preventive maintenance is practiced and routine work highly systematized.

Other Heat Sources

Other sources of heat have been used for railroad cars, some aimed at relieving the diesel locomotive from the problems of carrying water necessary for the pro-

* Abstract of a paper presented before the American Society of Heating and Ventilating Engineers, Philadelphia, January 1951

† Executive Engineer, Vapor Heating Corporation



Stop and check valve (Closed during start or shut down procedure)	1	Blower	8	Spark plugs	16
Atomizing air pressure regulator	2	Damper	9	Steam separator	17
Fuel pressure regulator	3	Fuel filter (pressure line)	10	Steam trap (return water line)	18
Fuel solenoid valve	4	Fuel filter (suction line)	11	Water pump	19
Safety valves	5	Heat exchanger	12	Water tank	20
Steam temperature limit control	6	Ignition transformer	13	Water treatment tank (strainer tank only if injector system is used)	21
Water by-pass regulator and switch	7	Motor converter	14		
		Return water strainer	15		

Piping diagram of Vapor-Clarkson steam generator, OK-4625 series

duction of steam and the additional fuel necessary for the steam generator. Others have been the outgrowth of electrical capacity problems. The advent of the modern high speed, light weight, passenger car has brought increased competition between neighboring rail lines. More and more consideration is given to passenger comfort and increased use of electrical equipment has been the result. Capacities of air conditioning equipment have increased from 5 and 6 tons to from 7 and 8 tons per car. Better lighting and more of it has been used. Radios, record players and intercommunication systems have imposed increased electrical loads. Diners are being built with entirely electrical kitchens. This constant increase in electrical load has increased the sizes of axle driven electrical generators to their limit. Axle load limits have been reached and alternate sources of electrical energy are being sought; on long transcontinental trains frequently a major portion of one diesel engine driven, have been used, but the problems erators and the locomotive contributes relatively nothing to the total tractive effort of the locomotive combinations.

In some cases head end electrical generating plants, diesel engine driven, have been used, but the problems of transmission between moving cars have not been satisfactorily solved.

More and more applications of individual engine generator sets on passenger cars are being made to solve the problems of increased electrical loads. Propane engines are used on some railroads for generating electrical energy and also for air conditioning. Much work is being done at the present time on diesel engine generator sets and in some of these cases, the waste heat from the diesel engine is being recovered. In some applications, the coolant water of the diesel engine is used as the heating medium within the car. In other applications, a liquid-to-liquid heat exchanger is used to heat water or a mixture of water and ethylene glycol which in turn is used as the heating medium. The largest single electric load is the air conditioning system, therefore, there is excessive capacity during non-air conditioning seasons. The energy may be used during the heating season as an auxiliary source of heat.

Thermostatic controls are arranged to use the available heat in predetermined sequence. First, electrical current is used either by strip heaters in the overhead heating system or immersion heaters to heat the heating fluid. This insures maximum loading on the diesel engine. Next, full use is made of the heat wasted to the coolant with thermostatic controls insuring constant engine manifold temperatures. Finally, the waste heat in the engine exhaust is used by means of a gas to liquid heat exchanger controlled by a by-pass butterfly valve in the exhaust line. The sizes of the engine generator sets used range from 20 to 35 kw. but full use of all recoverable heat will not satisfy the full heat load in colder climates and steam must still be used to supplement the engine heat unless an oil-fired water heater is used to make up any deficiencies. Such a heater may be used alone as the heat source, or in conjunction with the heat from the axle generators or engine generator sets.

Another solution to the problem of furnishing an in-

dividual source of heat for each car has been proposed and is being studied and tested at the present time. This is an offshoot of the so-called vapor phase system as applied to internal combustion engines. It consists generally of operating the engine at coolant manifold temperatures above the vapor temperatures at atmospheric pressures. The coolant flowing from the engine would be allowed to flash into steam and the steam condensed either in the heating system or under-car condensers. Higher engine efficiencies would result as well as increased overall thermal efficiency of the system. Pump heads seem, at the present, to be the limiting conditions when handling very hot liquids. There are also problems to be studied concerning the coring of the coolant water through the cylinder block of the diesel locomotives to avoid cavitation of the hot coolant liquids.

At present approximately 95 per cent of all passenger cars are heated with steam, therefore, its distribution and control are the major considerations of all railroad heating and air conditioning engineers. One diagram shows a typical steam heating layout for a coach. High pressure steam is transported through the cars by 2½-in. main steam lines and through flexible metallic conduits between cars. Steam pressures vary from 125 to 250 lb. per square inch. Total steam demand is greatly in excess of the total of the heat demand of the individual cars. The calculated heat loads of individual modern passenger cars at —20 deg. F. with a 40 m.p.h. wind is approximately 180,000 B.t.u. per hour, or about 185 lb. of steam per hour. Actual tests indicate steam consumption may be as high as 350 to 400 lb. of steam per hour per car. The difference in these figures is the loss due to main steam transmission lines and flexible metallic conduits, this loss increasing as temperature gradients increase.

The high pressure steam is reduced in pressure and fed thermostatically to the radiation at pressures from 3 to 12 lb. Condensate is wasted to the ground at temperatures of approximately 200 deg. F.

Control Problems Difficult

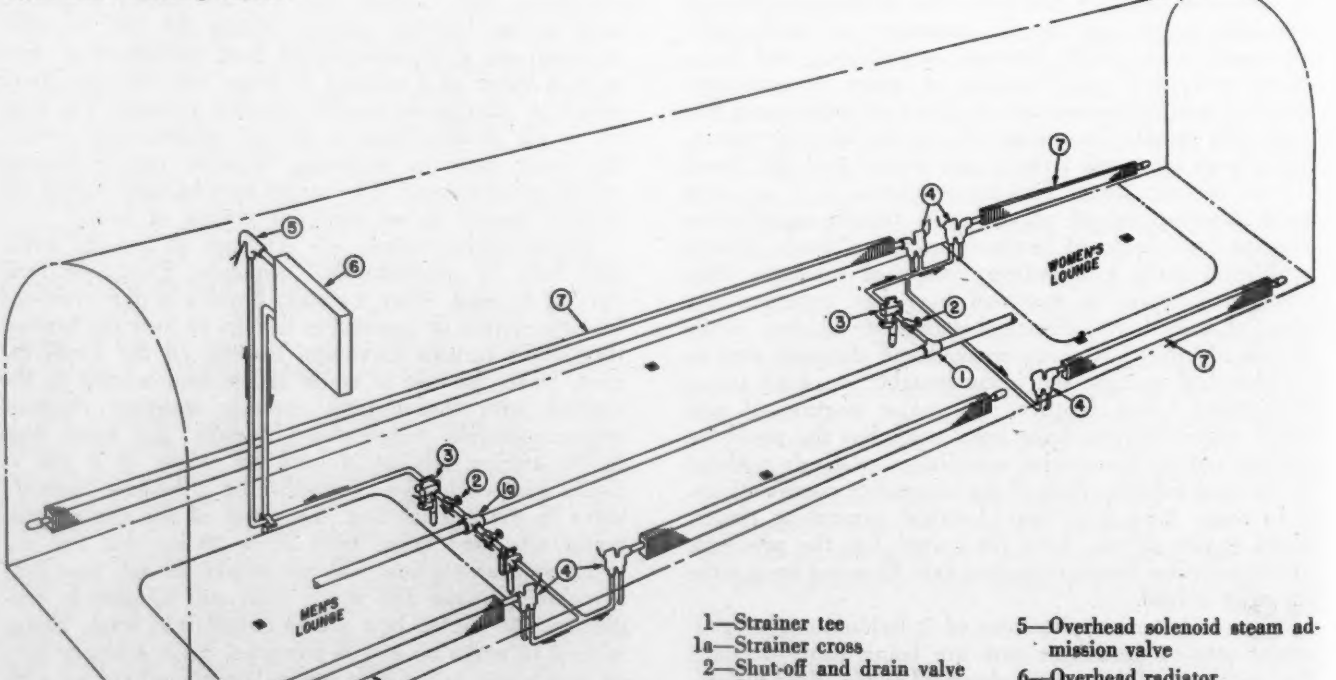
Nowhere in industry does the heating and air conditioning engineer have more difficult problems to solve and more precise control specifications to meet. The space to be controlled is exposed on all six sides. It may be, and is propelled through space at speeds up to 100 m.p.h. The same required equipment must be able to operate and control continuously from temperatures of 120 deg. F. in desert areas to —60 deg. F. in Canada or the Pacific Northwest.

Only one manual switch is used on the majority of passenger cars. This is a simple OFF and ON switch. Thermostatic controls determine whether the car will be heated, ventilated or air conditioned. A 1-deg. ventilating dead band is usually used between heating and cooling, although cooling will extend into the heating band. For example, a car will be heated to 75 deg. F., ventilated to 76 deg. F. and air conditioned from 76 deg. F., although the car may be cooled down to as low as 68 deg. F. It is evident that controls must respond within less than ±0.5 deg. F. to avoid hunting from heating to cooling and the reverse. An outside thermostat is used for positively locking out the compressor circuits when outside ambient temperatures are above a predetermined level.

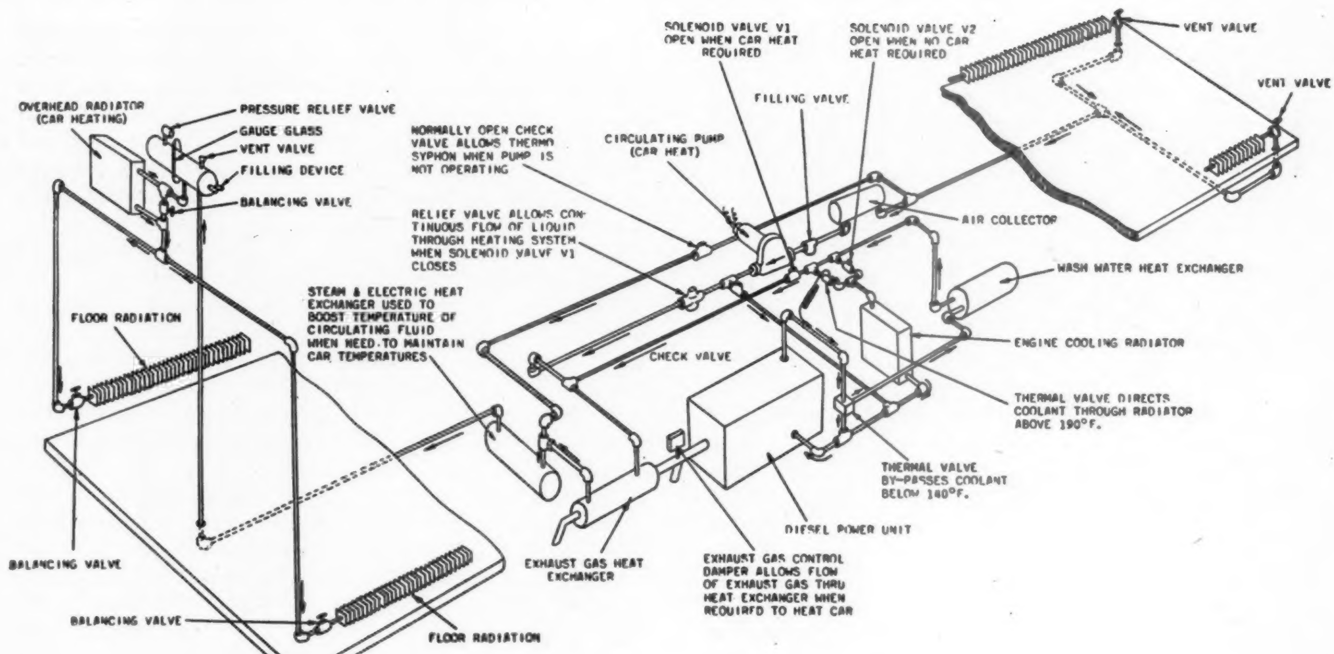
Car Heating Design

The heating system of a railroad car may be divided into three separate parts: an overhead forced air system, a side wall radiation system, and the radiant heating at the floor line.

Open-coach heating layout



1—Strainer tee
1a—Strainer cross
2—Shut-off and drain valve
3—Safe control regulator
4—Solenoid steam admission valve
5—Overhead solenoid steam admission valve
6—Overhead radiator
7—Unit floor radiation
■—Thermostat



Schematic diagram of a waste-heat recovery system

The overhead forced air system is usually designed to take from 25 to 50 percent outside air, filter it, heat or cool it, and deliver it to the car through aspirating or diffusion type of outlets. With increases in air conditioning capacities, volumes of air have increased to avoid frosting of the evaporator coils. Air handled has increased from an average of 1,500 c.f.m. on pre-war cars to 2,400 c.f.m. on postwar cars. Since duct sizes have remained relatively fixed, velocities have increased and air temperatures must be held fairly constant at the outlet to avoid hot and cold drafts. On pre-war cars air intake hoods and filters increased in static pressure with the speed of the car and the result generally was 100 per cent recirculated air at speeds of 50 m.p.h. and over. Since the war, intake hoods have been designed with a fairly even static head resulting in use of outdoor air at high speeds and increasing the total heat demand of the system.

If outdoor air intakes do not function at high speeds and exhaust fans are used, it is evident that a negative pressure might result in the car body and that is the case in a large proportion of the present railroad cars. Air leakage is increased tremendously and difficulty is encountered in keeping end doors closed. The problems imposed on the control system under these changes of air distribution require careful study and extreme accuracy to overcome. To overcome the problems of negative pressure and the resultant dirt problem, some cars have been pressurized to insure correct air distribution and cleanliness. The plenum chamber is sealed and no exhaust fans are used. Leakage stacks provide air outlets and air pressures of fractions of an inch are maintained throughout the car body.

All types of filters have been used including electrostatic, centrifugal and activated carbon. Those filters used most generally, however, are the wire mesh oil dipped type.

The increasing volumes of air handled in overhead systems has increased heating coil sizes from a pre-war average of about 58,000 B.t.u. per hour to about 100,000 B.t.u. per hour on new cars.

Even with the increase in volume, velocity and heat input in the overhead system, tests prove conclusively that the overhead air stream cannot penetrate to the floor line of the cars without raising discomfort levels to unbearable limits. It must be remembered that conditions in railroad cars differ radically from those encountered in industrial or domestic service. Passengers sit next to, or in actual contact with, cold external walls and windows. Distances from air outlets to passenger contact are at a minimum. Outlets may be directly over the passenger at a distance of five ft. from the head level when seated. The inability to penetrate to the floor line necessitates the use of other heating systems to insure warmth at external walls and floor line.

A side wall heating system consisting of finned radiation is used to insure a vertical film of hot air along the side walls of the car. Such a system has been used for many years in railroad cars and while the full value of the system was not realized, its use became almost universal.

Before air conditioning became widely used, windows on all railroad cars were single glazed and also storm windows were used in cold weather. At that time, windows were approximately 40 per cent of the side wall of the car adjacent to the passengers. These windows had large leakage factors and a high velocity vertical air film was the only method of counteracting such heat losses. Today windows make up approximately 80 per cent of the car side wall exposed to passengers, but are double glazed and are well sealed in rubber. Radiant losses and gains have replaced the convectional losses and different methods are used to counteract these losses. In addition, heat distribution is better understood and may be more closely calculated.

Today the action of the side wall radiation is divided into two functions, that of convectional currents rising vertically along the outside wall and the radiant heat

radiating in straight lines from the radiator guards in the form of infra-red rays.

It can be visualized then, that the air currents in the confined 10 ft. wide space of a railroad car are at right angles to each other. A main air stream from the overhead system follows a path longitudinally of the car body and the convectional air currents from the side wall radiation move transversely and at right angles to the main overhead stream. These air movements become more complicated in multiple room cars but the main streams will retain their individual characteristics.

At one time it was felt that the convection currents from the side wall radiation kept the ankles and feet of passengers warm. It is now realized that the air currents moving from the aisle toward the side wall radiation must of necessity, be considerably cooler than the warm air delivered from the overhead system or the air rising from the side wall radiation. Today the value of infra-red radiation is fully recognized and indeed the raising of mean radiant temperatures to comfort levels has been a goal for some years. In 1934 the warm air from the side wall radiation was first used behind wainscot sheets being released at the window sill, thus giving a radiant shield between passengers and side walls and making effective a film of rising warm air on the inside of the windows. Today many cars are making use of such panel heated construction to improve heat distribution and increase the efficiency of the heating system.

Zoning Necessary

In addition to the foregoing problems which must be solved by the control engineer, it has been found necessary to zone individual cars. End doors of the cars are constantly being opened, thus allowing cold air currents to enter the car body. This is especially objectionable at the non-recirculated end of the car where these cold air currents may easily affect passengers adversely in the first two or three seats. For this reason, radiation at the end of the car is controlled separately by thermostats in that zone. In addition, lounge rooms for men and women are zoned separately as well as individual rooms in multiple room cars.

Additional zoning is used on many railroad cars which travel from east to west across the country and from north to south on long trains. Here recognition is given to the differences between sunny and shady sides of the car, and, consequently, thermostats on each side of the car regulate the amount of heat input to the car in accordance with radiant heat being added to that side of the car by sun effect. A particularly difficult problem in radiant effect is found in the dome cars, now being used on many of the railroads. These cars are double-deck cars with the upper deck being in the form of a bulge at the roof line, the outer skin of the bulge being approximately 95 per cent glass. Here radiant effect of sun can influence greatly the heating and air conditioning loads in the car, and thermostats sensitive to radiant heat are used to adjust the normal car thermostats to balance the heat input to the radiant heat imposed on the car structure.

Thermostatic control theories are fairly well defined although changes in seating arrangements and partition locations constantly must be analyzed anew. In general, it is well accepted that the overhead heating system must be fully used at all times to conform to the standards of ventilation set up by the U. S. Public Health Service. Thus the overhead system is used to heat the car until outside conditions, as indicated by inside temperatures, indicate the need for additional heat requirements from the side wall heating system. To accomplish this, side wall heating is tied in thermostatically to the overhead system and cannot be used except when a call for heat is recognized by the overhead heating thermostats. Such a system insures balance of heat and allows temperature levels to be maintained with 1 deg. bands from end to end of the car and from floor to ceiling.

Bimetallic thermostats do not have the precision of control necessary for railroad requirements, nor will they stand the high vibration and shock conditions encountered. A mercury thermostat specially designed to meet these conditions is used almost universally for control. Where extremely cold temperatures are encountered, a mercury thallium amalgam is used in place of pure mercury in the thermostat. A unique feature of the thermostat is the fact that a secondary mercury bulb may be used. This bulb is wrapped with a resistance winding and insulated to be unaffected by ambient temperatures. The result is a thermostat which may be influenced by ambient temperatures or by artificial heat applied electrically through the resistance winding of the secondary bulb. The secondary bulb may be used in two ways. A steady amount of current may be imposed on the heat winding to set the thermostat down below its fixed temperature setting. Thus an 80 deg. thermostat may be used as a 78, 76, 75 deg. thermostat eliminating the need for an infinite number of fixed setting thermostats. By using a potentiometer in series with the heat winding, a controllable thermostat is obtained.

The heat winding on the secondary bulb may be used in another important fashion. By placing a resistance in parallel with the fixed resistance used for set down and having this resistance cycled by the relay operated by the thermostat, additional heat may be imposed on the secondary bulb when the mercury column is not in contact with the control point. When the mercury is in contact with the control point, a relay cuts out the cycling resistance and allows ambient temperature to affect the thermostat alone. By weighting the cycling resistance to the latent heat in the radiation being controlled, the heat input may be shut off at a point where the remaining latent heat in the radiation will bring the temperatures to the control point without overruns or underruns. While many thermostats now use this feature, basic patents restricted its use to such mercury thermostats until recently.

Mercury thermostat-relay combinations control solenoid steam admission valves, electric strip heaters, oil fired heaters and, through interlocks, control the air conditioning equipment.

Air Conditioning Systems

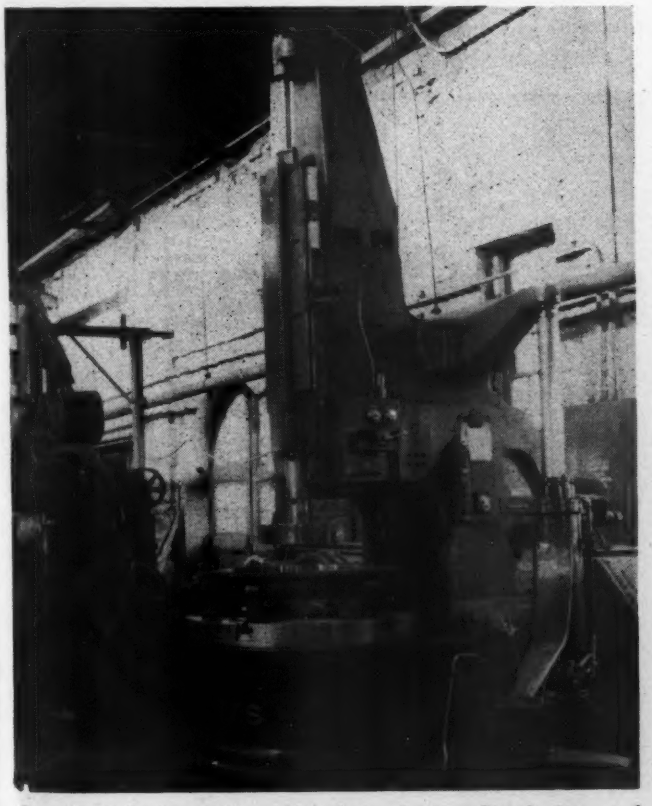
While electro-mechanical air conditioning equipment is most widely used, there are many cars equipped with steam jet systems and many which still use ice activated systems. It has been found that, generally, dry bulb control will give satisfactory results although reheat has been used in several ways. Overhead steam radiators have been used as well as electric strip heaters. In some cases reheat is under control of the occupant of a single room by means of a small electric heater in the duct outlet of the individual room. In addition, wet bulb control has been used in some cars and combination wet and dry bulb control has been used.

Diesel Tire Turning On Car Wheel Boring Mill

Additions made to a car wheel boring mill at the Bloomington, Ill. shops of the Gulf, Mobile & Ohio consist of an extension head on a 6½-L boring bar which permits boring diesel switching locomotive tires and machining diesel wheels. The primary purpose of installing the extension head was to eliminate the need for retaining a tire turning lathe after the G.M.&O. became fully dieselized. Experience with the arrangement has shown, however, that this method is faster and it does a better job. The double-tool arrangement used results in tires bored to within .001 in. out of roundness and .001 in. straightness. In over two years there has been no loose tire trouble.

The extension head is mounted to the vertical boring bar with a light press fit, approximately 500 lb. It is secured with two keys made from tools, and with two set screws. The tools are adjusted for different boring diameters by taper blocks on each end. Carbide tools are used with a speed of 15 r.p.m. and a feed of .030 in. The tires are bored to snap gauge limits with a tolerance of .004 in.

The second addition permits turning, facing and boring wheels on the one machine by machining the diesel wheel inside and outside hubs with a facing bar. An adjustable stop for the horizontal or facing ram is incorporated on one side of the machine. This is a bell crank leverage which stops the travel of the ram at the desired point, which point is set by individual gauges for different size wheels. Each gauge allows for the diameter of the vertical boring bar and enough more to face out to the outside circumference of the hub. The gage is used to set the top bar on the adjusting leverage, and an arrow on the bottom bar is brought in line with a mark on the top bar.



Car-wheel boring mill equipped for boring diesel tires and facing inside and outside hubs

The bell-crank arrangement for controlling the travel limits of the facing ram. When set by a gage used on the vertical boring bar, the pointer near the ram is moved axially along the ram to the point at which the travel of the ram is to be stopped

The sequence of operations on the modified mill is:

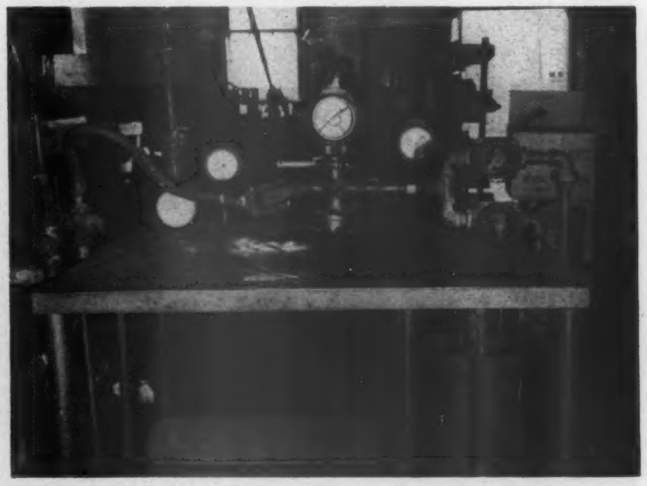
(1) Turn outside, or water guard, hub; (2) Face outside hub; (3) Turn wheel over; (4) Face and bore wheel; (5) Set the turning jig and turn the hub for the grease guard, or inner hub.

Test Device Tester

The Chicago Great Western makes the required checks on single-car testing devices at Oelwein, Iowa with an arrangement which is suitable for testing either freight or passenger car testing devices. The testing arrangement gives an orifice test to see that the proper pressure drop occurs in the required time. The arrangement also tests pipe leakage.

The bench is equipped with a timer and all necessary gages. Three reservoirs are mounted underneath the bench to provide the two different reservoir capacities required for testing testing devices.

The operation of the testing bench for changing from passenger-car to freight-car single-car testing devices is simple. To test the passenger car apparatus the top valve is closed and the bottom valve opened. Freight car testers are checked by closing the bottom valve and opening the top valve.



Test bench for checking either passenger or freight car single-car testing devices

The diesel power unit, uncoupled from the cars, is sprayed with a mild acid solution as it is run through the mechanical washer (left). Under parts are steam cleaned and thoroughly water rinsed. These operations require about 8 min. During the next 27 min. the cars pass through the washer. Below: lubricating the truck journal boxes

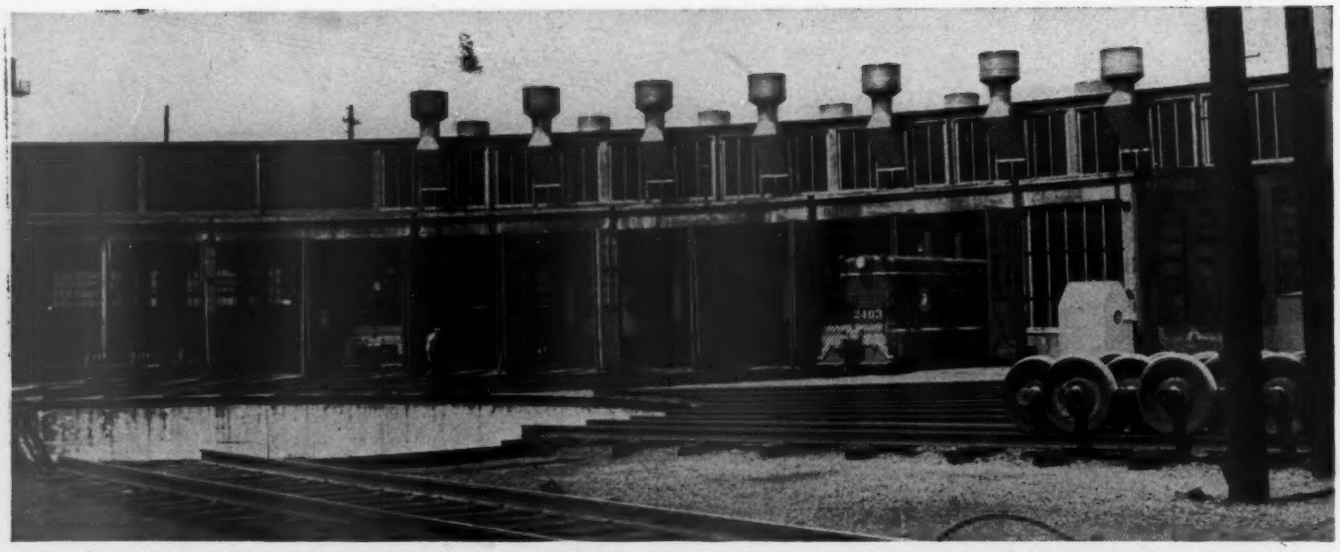
Cleaning and Servicing The "Shasta Daylight"*

* From an article prepared for the Southern Pacific Lines Bulletin

Mechanics check air-conditioning units, lights, public address system, and (right) the electric brake system

Time allowed for the cleaning, maintenance and servicing of cars and diesel power is approximately six hours, or about 750 man-hours

Replacing empty propane gas cylinder. Cars are spotted on elevated repair track equipped with drop pits for quick removal and replacement of wheels



Seven stalls in this roundhouse have been converted for progressive maintenance work on Diesel-electric locomotives

Facilities for Diesel Repairs*

The considerations involved in the layout and operation of shops for diesel maintenance are discussed with relation to the facilities required

By R. H. Herman†

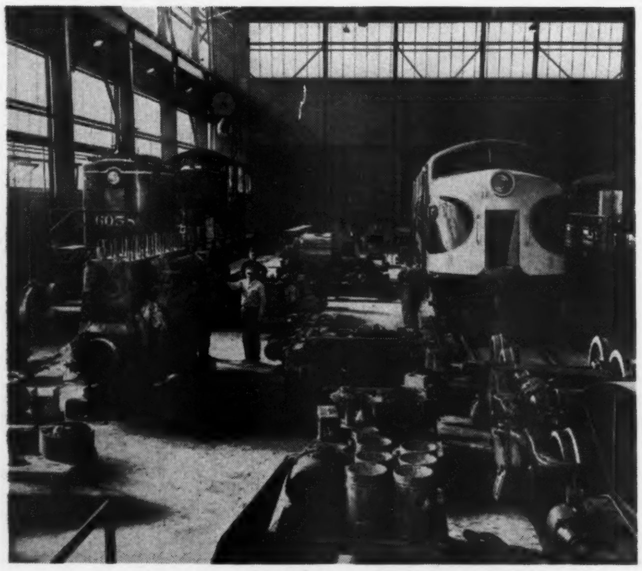
CAREFUL studies are required in the initial planning of shops or maintenance facilities for diesel-electric motive power. These studies should be made before the locomotives are ordered and should include careful consideration of all the factors outlined below to insure adequate and efficient facilities for proper repairs and maintenance of this type of equipment:

1. *Number and type of locomotive units to be maintained*—A careful analysis should be made to determine the number of locomotive units to be maintained in a given territory. This study should include allowances for future purchases and be based on the maximum number required for complete dieselization. Passenger, freight and switching locomotives require slightly different shop arrangements and the study should include an analysis of these factors. If passenger locomotives are involved it is comparatively easy to prepare a chart covering the exact time each locomotive will be in the shop or terminal for repairs. Freight locomotives are generally operated in a pool, and the period in a shop can be determined from the mileage or time between shoppings and the work to be done. Switching locomotive shop time can be determined primarily on the basis of daily or monthly inspections. A summary of this data, including allowances for future dieselization, will

* The first of several articles which constitute an abstract of material appearing in the 1951 Edition of the Locomotive Cyclopedia, Shop Section

† Engineer Shops and Equipment, Southern Railway System

Inspection pit tracks for progressive maintenance, including depressed floor and platforms, in a converted steam locomotive shop



Heavy repair section in a combination heavy and progressive maintenance shop

provide a complete picture of the number of tracks or working space required.

2. *Location*—This factor is extremely important in the planning of any diesel facility. Locomotive assignments and operations may be entirely different from that of steam locomotives because of the greater mileage between shoppings and the desirability of concentrating such work in as few shops or locations as possible. The operation of steam locomotive required a roundhouse or equivalent at each division point and at most junction points, with heavy repair or back shops at convenient locations. One diesel shop, properly located, can adequately maintain and service all the passenger and freight units on even a large system, supplemented by limited facilities at outlying points for turnaround inspections or diesel switcher maintenance.

The location will also be dependent upon the scheduling of locomotives, but if practicable it should be adjacent to existing locomotive shops or facilities to utilize present store houses, labor forces, supervision, etc., and reduce the initial investment. In this connection, it must be considered that steam facilities may be completely abandoned in the future and consequently should not have too important a bearing on the location of a new diesel shop. If too much emphasis is placed on utilization of existing facilities, full advantage may not be taken of the operating efficiencies possible with diesels.

An important factor in selecting the location for a proposed Diesel locomotive repair shop is that locomotives should be operated to that location in revenue service. The large initial investment as well as potential earning power makes it imperative that dead heading or time moving a locomotive to and from the shop be eliminated or reduced to the lowest practicable amount. Facilities should be located as close as possible to the arrival and departure tracks.

3. *Type of work to be performed*—The character of maintenance and repair work can be classified as turnaround inspections of running gear, etc., as required by the Interstate Commerce Commission, monthly inspections, routine or progressive maintenance on a mileage or time basis, and heavy repairs. An analysis should be made of the number of locomotives to receive each class of work in a given shop, and facilities should be provided to adequately and efficiently perform this work. The type of shop layout for each class of work will be discussed in detail in a succeeding article.

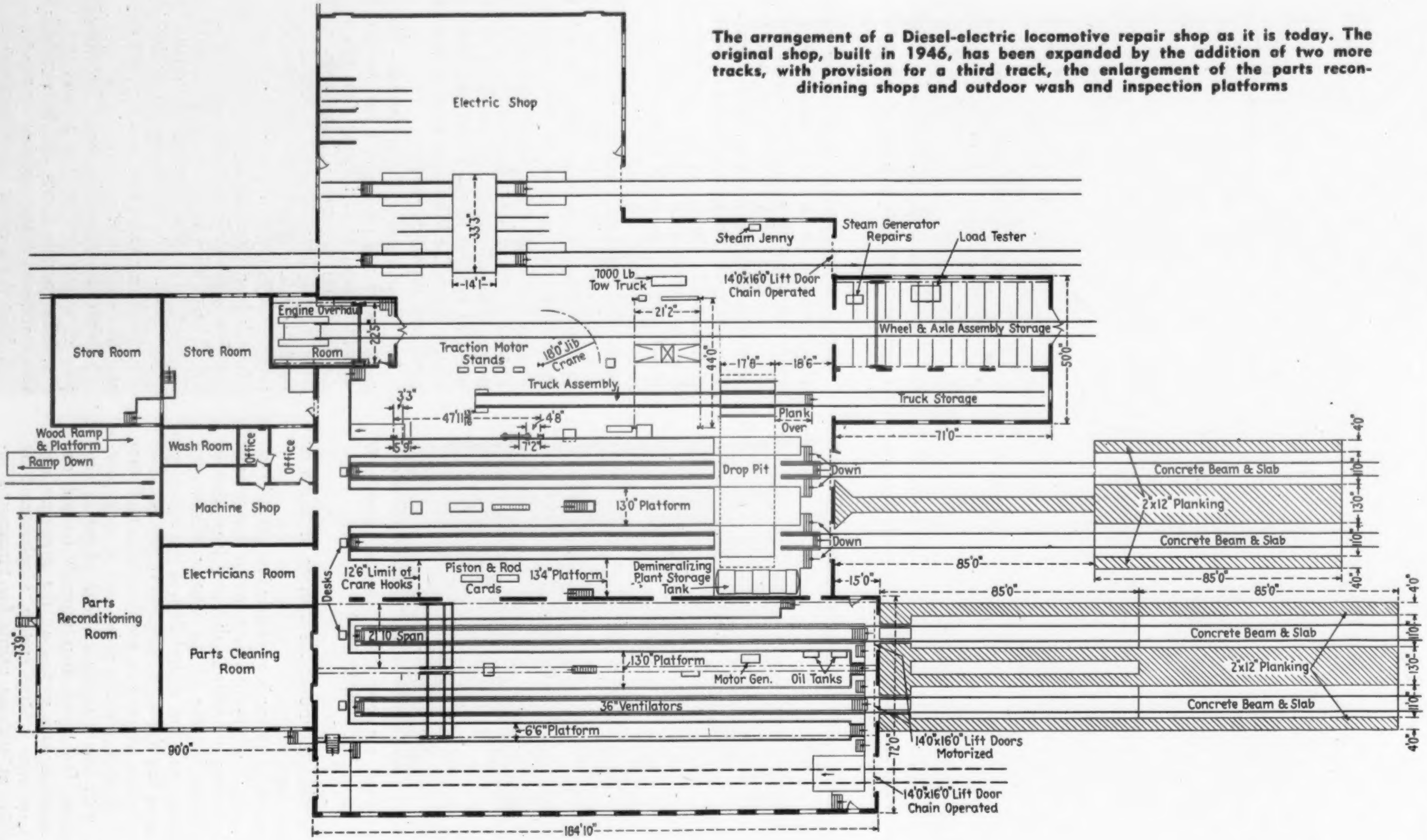
The questions below determine the facilities required.

a. What arrangements will be required for turnaround inspections?

b. Must provisions be made for changing a single pair of wheels and traction motor?

c. What arrangements will be required for progressive maintenance and running repairs?

d. Must the complete truck be removed for overhaul and repair?



The arrangement of a Diesel-electric locomotive repair shop as it is today. The original shop, built in 1946, has been expanded by the addition of two more tracks, with provision for a third track, the enlargement of the parts reconditioning shops and outdoor wash and inspection platforms

e. Will the diesel engine itself be removed and replaced and must provisions be made to overhaul it?

f. Will it be necessary to remove and replace the main generator, steam heat generator and other heavy parts?

g. Must provisions be made for heavy overhaul work. Such work may consist of heavy repairs after a wreck or derailment, major repairs to locomotive cab, frame, equipment in general or trucks, and conversion or rebuilding for increased ratings or modernization.

4. *Effect on proposed layout of increased use of diesel locomotives or complete dieselization of a system*—These factors will affect the number of tracks, amount of working space and size of facilities. Such additional space can be provided in the initial layout or provisions made in design so that it can be added when required in the future. In the early days of diesel shop planning these considerations were often overlooked or neglected with the result that many diesel shops have been outgrown. Such shops have had to be retired and replaced by more adequate facilities.

Turnaround Inspection

Provisions must be made at outlying points or terminals as well as at shop locations for turnaround inspections of diesel locomotive units. I. C. C. regulations require an inspection of the underframe, trucks, wheels, air brake equipment and safety devices at the end of each trip but not less than once each 24 hours.

Facilities for this work can be relatively simple depending upon the number of locomotives to be handled and whether any emergency repair work must be performed. If only a few locomotives are involved they can be inspected on an outside track provided with concrete platforms or walkways on each side and it is not essential that they be placed in a shop or building.

At locations where a large number of locomotives are handled and a certain amount of emergency repairs performed an inspection pit on an outside track or inside a building in colder sections of the country is very desirable for work on trucks and traction motor equipment. The inspection pit should be long enough for a complete locomotive, be well drained and provided with adequate lights in the pits and outside. Preferably the inspection pit should be enclosed or covered by a shed roof, with a small shop building to house tools, equipment and machines for emergency repair work.

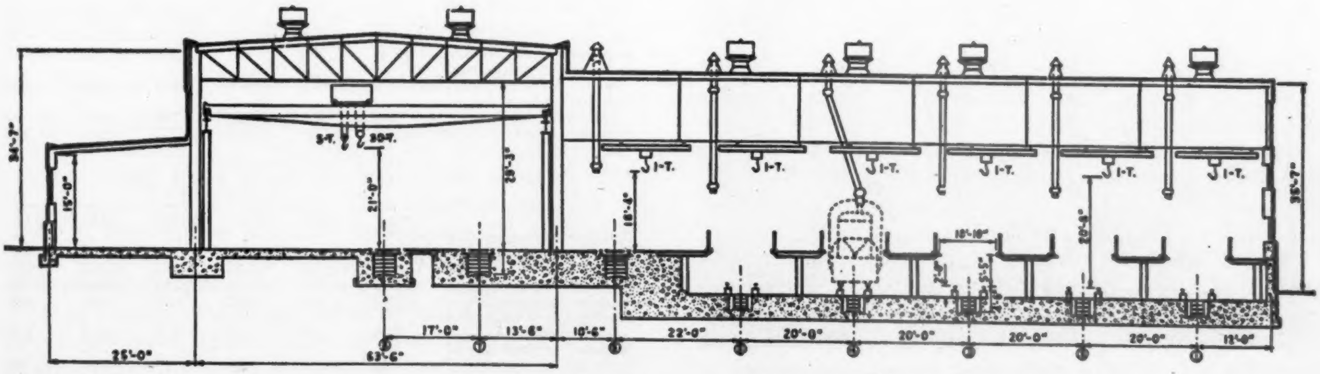
The turnaround location is normally equipped for routine servicing of the diesel locomotive with storage, pumping and disbursing facilities for Diesel fuel oil, provisions for washing underframe and cab, sand storage and disbursing arrangement, all of which may be grouped around the inspection pit or track. Lubricating oil as makeup for the diesel engine may be handled from barrels or pumped from storage tanks. Water should be available for steam heat boiler use on passenger locomotives and makeup in engine cooling system. Steam should be available to keep locomotives from freezing in extreme cold weather, and for cleaning purposes.

It is generally not necessary to provide any means for changing wheels, traction motors or other heavy parts at location devoted solely to turnaround inspection work. In the event of failure a defective traction motor or locomotive unit may be cut out and moved to the regular repair point for necessary work. At big terminals, however, where a large number of units are handled, such occurrences may be frequent and it may be desirable to provide some means for changing wheels and traction motor. Increased locomotive availability, elimination of delays to important trains and reduced labor costs will be sufficient to justify such an expenditure.

Turnaround inspection work may represent an important part of the work at a large diesel shop due to the number of times the locomotive is in the terminal area in normal operation between shoppings. At one location a diesel-electric locomotive is operated 3,500 to 4,000 miles before being taken into the shop for routine progressive maintenance but it may be in the terminal as many as eight times between shopping periods for turnaround inspection. In order to provide satisfactory space outside the shop, concrete walkways 410 feet long were installed between and outside two parallel tracks, providing space for four four-unit freight locomotives at one time. The platforms were well lighted and provided with fueling standards, water outlets and sanding facilities.

Periodic Inspection and Maintenance

Periodic maintenance or progressive maintenance covers the running repair procedure on diesel locomotive and consists of removing various engine and locomotive parts on a mileage or time basis, and replacing them with new parts from the manufacturer or with parts which were previously removed, overhauled and reconditioned. It also includes monthly and annual I. C. C. inspections. Progressive maintenance shops will vary widely in size, arrangement and type of equipment, dependent on the number and type of locomotives to be repaired and whether new facilities are provided or existing facilities converted for diesel work.



The cantilever design of the upper working platforms and the placing of the floor level in the truck-repair section on the same level as these platforms are features illustrated by this shop cross-section

The result of low water and a crown-sheet failure

Locomotive Inspection Report

Report of the I. C. C. Bureau shows 4,123 less steam locomotives and 3,027 more diesels; accidents decline from previous year

BOTH THE number of accidents and the injuries as a result thereof showed a decline during the fiscal year ended June 30, 1950, according to the annual report of the Interstate Commerce Commission Bureau of Locomotive Inspection, presented by Director Edward H. Davidson. As compared with 1949 the number of accidents were reduced from 277 to 220 and the number of persons injured from 250 to 234. The number of persons killed as a result of locomotive parts failures was 10, the same as the previous year.

The accidents resulting from failures of steam-locomotive parts alone were reduced from 228 to 169, the number killed from 10 to 7, and the number injured from 243 to 184. The number of steam locomotives for which reports were filed, however, dropped from 33,866 in 1949 to 29,743 in 1950, and the number inspected from 85,353 to 66,809.

Accidents caused by failures of parts of locomotives other than steam increased from 49 to 51. Three persons were killed in these accidents in 1950; none in 1949. The number of persons injured decreased from 67 to 50.

A table shows the various parts and appurtenances of steam locomotives and tenders, the failures of which have caused serious and fatal accidents during the past

TABLE I—INSPECTIONS AND THE CONDITIONS FOUND

STEAM LOCOMOTIVES

	Year ended June 30					
	1950	1949	1948	1947	1946	1945
Number of locomotives for which reports were filed	29,743	33,866	37,073	39,578	41,851	43,019
Number inspected	66,809	85,353	93,917	94,034	101,869	115,979
Number found defective	6,740	7,035	9,417	10,248	11,337	11,975
Percentage inspected found defective	10.1	8.2	10.0	10.9	11.1	10.3
Number ordered out of service	399	436	654	708	690	506
Number of defects found	28,504	28,642	38,855	41,250	56,541	53,367

LOCOMOTIVES OTHER THAN STEAM

	Year ended June 30					
	1950	1949	1948	1947	1946	1945
Number of locomotive units for which reports were filed	15,719	12,692	9,803	7,805	6,616	6,094
Number inspected	42,503	30,684	20,798	13,115	10,908	9,888
Number found defective	2,748	1,238	853	633	499	447
Percentage of inspected found defective	6.5	4.0	4.1	4.8	4.6	4.5
Number ordered out of service	42	20	21	19	17	16
Number of defects found	6,325	2,804	1,745	1,442	1,385	1,212

TABLE II—ACCIDENTS CAUSED BY LOCOMOTIVE PARTS FAILURES

STEAM LOCOMOTIVES, INCLUDING BOILER, OR TENDER

	Year ended June 30					
	1950	1949	1948	1947	1946	1945
Number of accidents	169	228	341	360	419	410
Percent increase or decrease from previous year	25.9	33.1	5.3	14.1	[1]2.2	1.7[1]
Number of persons killed	7	10	15	16	10	20
Percent increase or decrease from previous year	30.0	33.3	6.3	[1]60.0	50.0	20.0
Number of persons injured	184	243	361	464	439	429
Percent increase or decrease from previous year	24.3	32.7	22.2	[1]5.7	[1]2.3	7.9

[1] Increase.

STEAM LOCOMOTIVE BOILER [1]

	Year ended June 30							
	1950	1949	1948	1947	1946	1945	1915	1912
Number of accidents	59	81	104	116	156	141	424	856
Number of persons killed	4	9	14	12	10	13	13	91
Number of persons injured	70	94	108	124	165	154	467	1,005

[1] The original act applied only to the locomotive boiler.

LOCOMOTIVES OTHER THAN STEAM AND THEIR APPURTENANCES

	Year ended June 30					
	1950	1949	1948	1947	1946	1945
Number of accidents	51	49	41	40	38	29
Number of persons killed	3	....	....	2	....	1
Number of persons injured	50	67	50	41	56	40

five years. Of the 169 accidents in 1950, 46 were caused by the failure of miscellaneous parts not classified. Classified were 35 parts, failures of which caused 123 accidents. The largest single group is handholds, which caused 11 accidents. Other sizable groups are boiler explosions, reversing gears and squirt hose, each the cause of nine accidents, and footboards, the cause of eight accidents. Injectors and connections and throttle rigging were each the cause of seven accidents. The number of accidents charged to each of the other parts range from one to six and in most cases do not exceed three. Failures which were the cause of death were boiler explosions (4); couplers (1); crossheads and guides (1), and reverse gears (1). The report calls attention to this table with the suggestion that, if advantage is taken of the information contained in it and proper inspection and repairs made in accordance with the requirements of the law and rule, many accidents will be avoided. An abstract of the remainder of the report follows.

During the year, 10 per cent of the steam locomotives inspected by our inspectors were found with defects or errors in inspection that should have been corrected before the locomotives were put into use; this is an increase of 2 per cent from the results obtained in the preceding year. Three hundred and ninety-nine locomotives were ordered withheld from service by our inspectors because of the presence of defects that rendered the locomotives immediately unsafe; this is a decrease of 37 locomotives compared with the preceding year.

Explosions and Other Boiler Accidents

Nine boiler explosions occurred in the fiscal year; all were caused by overheating of the crown sheets due to low water. Four employees were killed in these accidents and 14 were injured. There was an increase of four in the number of boiler explosions and a decrease of three in the number of employees killed compared with the preceding year.

One of the explosions occurred on a locomotive in passenger-train service, three on locomotives in freight-train service; two on locomotives in charge of watchmen; and one each on locomotives in switching, mixed, and work train service. The boilers involved in the explosions were not equipped with either fusible plugs or low-water alarms.

Absence of a safe water level was known to employees on two of the locomotives prior to the explosion. On one of these the low water level resulted from undetected loss of water through an inadvertently opened blow-off cock which discharged through a muffler located under the locomotive deck. Action to restore water to the boiler had been initiated, but the explosion occurred before a sufficient quantity of water had been fed to the boiler. Subsequently, blow-off mechanisms on all locomotives owned by the railroad on which the explosion occurred were examined, redesigned, and reconstructed where necessary to prevent repetition of conditions responsible for the explosion.

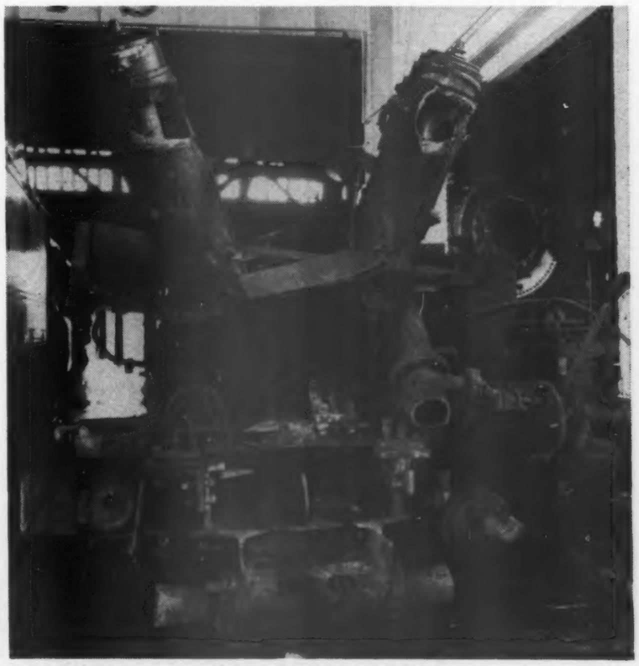
Fifty boiler and appurtenance accidents other than explosions resulted in injuries to 56 employees. This is a decrease of 26 accidents and a decrease of 24 injuries compared with the preceding year.

Flue Removal Extensions

Four hundred and seventy applications were filed for extension of time for removal of flues, as provided in rule 10. Our investigations disclosed that in 33 of these cases the condition of the locomotives or other circumstances were such that extensions could not properly be granted. Nine were in such condition that the full extensions requested could not be authorized, but extensions for shorter periods of time were allowed. Twenty-four extensions were granted after defects disclosed by our investigations were required to be repaired. Eighteen applications were cancelled for various reasons. Three hundred and eighty-six applications were granted for the full period requested.

Locomotives Other Than Steam

Fifty-one accidents, resulting in 3 deaths and injuries to 50 persons occurred in connection with locomotive



A cast-steel frame tail piece which failed as the result of a progressive crack

TABLE III—ACCIDENTS AND CASUALTIES RESULTING FROM FAILURES OF LOCOMOTIVE PARTS

STEAM LOCOMOTIVES AND TENDERS, AND THEIR APPURTENANCES

Part or appurtenance which caused accident	Year ended June 30														
	1950			1949			1948			1947			1946		
	Accidents	Killed	Injured	Accidents	Killed	Injured	Accidents	Killed	Injured	Accidents	Killed	Injured	Accidents	Killed	Injured
Air reservoirs	...	...	...	...	...	...	1	...	2	1	...	1	1	...	1
Aprons	2	...	2	3	...	3	5	...	5	4	...	4	2	...	2
Arch tubes	1	...	1	...	...	...	...	...	...	...	...	...	...	...	...
Ashpan blowers	...	...	...	1	...	1	...	...	...	...	...	...	1	...	1
Axles	...	...	...	...	...	...	3	...	3	1	2	1	1	...	1
Blow-off cocks	2	...	2	5	1	4	5	...	5	8	...	8	15	...	16
Boiler checks	3	...	3	4	...	5	7	1	6	7	...	7	8	...	8
Boiler explosions:															
A. Shell explosions	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
B. Crown sheet; low water; no contributary causes found	8	4	12	4	6	13	10	12	8	11	7	16	15	7	20
C. Crown sheet; low water; contributary causes found	1	...	2	1	1	1	3	...	7	2	4	3	3	3	2
D. Miscellaneous firebox failures	...	...	...	...	...	...	...	...	...	2	...	4	1	...	1
Brakes and brake rigging	2	...	2	3	...	4	11	...	24	8	...	12	10	...	12
Couplers	4	1	4	3	...	4	4	...	4	6	...	6	5	...	5
Crank pins, collars, etc	1	...	1	...	...	...	2	...	2	3	...	3	5	...	5
Crossheads and guides	1	1	2	1	...	1	1	...	1	2	...	2	3	...	5
Cylinder cocks and rigging	...	...	...	...	...	...	3	...	3	3	...	3	1	...	1
Cylinder heads and steam chests	...	...	...	...	...	...	1	...	1	2	...	2	1	...	1
Dome caps	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Draft appliances	...	...	...	3	...	3	...	...	...	...	...	...	2	...	2
Draw gear	1	...	1	...	...	...	...	...	...	1	...	1	1	...	1
Fire doors, levers, etc	2	...	2	3	...	3	10	...	10	2	...	2	2	...	2
Flues	6	...	9	3	...	3	8	...	9	4	...	4	10	...	12
Flue pockets	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Footboards	8	...	8	10	...	10	15	...	15	15	...	15	12	...	12
Gage cocks	...	...	...	1	...	1	...	...	...	...	...	...	...	...	...
Grease cups	1	...	1	...	...	...	...	...	...	1	...	1	1	...	1
Grate shakers	6	...	6	11	...	11	15	...	15	20	...	20	25	...	25
Handholds	11	...	11	13	1	12	12	...	12	18	...	18	20	...	20
Headlights and brackets	1	...	1	1	...	1	3	...	3	2	...	2	2	...	2
Injectors and connections (not including injector steam pipes)	7	...	7	12	...	12	10	...	10	14	...	14	14	...	14
Injector steam pipes	...	...	...	...	...	...	4	...	5	4	1	4	2	...	2
Lubricators and connections	2	...	2	4	...	4	2	...	2	4	...	4	5	...	5
Lubricator glasses	1	...	1	1	...	1	...	...	...	...	...	...	2	...	2
Patch bolts	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Pistons and piston rods	...	...	...	...	...	...	2	...	2	1	...	1	...	...	...
Plugs, arch tube and washout	1	...	1	...	...	...	3	...	3	1	...	1	1	...	1
Plugs in firebox sheets	...	...	...	...	...	...	...	...	...	...	...	...	1	...	1
Reversing gear	9	1	8	6	...	6	12	...	12	13	...	13	11	...	11
Rivets	...	...	...	1	...	1	...	...	...	...	...	...	...	...	...
Rods, main and side	1	...	2	2	...	2	5	...	7	3	1	2	7	...	7
Safety valves	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Sanders	4	...	4	4	...	4	4	...	4	5	...	5	4	...	4
Side bearings	...	...	...	1	...	1	...	...	...	...	...	...	...	...	...
Springs and spring rigging	3	...	3	1	...	1	4	...	4	3	...	77	6	...	7
Squirt hose	9	...	9	14	...	14	5	...	5	19	...	19	14	...	15
Staybolts	1	...	1	...	...	...	4	...	4	2	...	2	1	...	1
Steam piping and blowers	3	...	6	4	1	3	13	1	13	4	...	4	15	...	15
Steam valves	3	...	3	3	...	3	6	...	6	8	...	8	13	...	13
Studs	1	...	1	1	...	1	...	...	...	2	...	2	1	...	1
Superheater tubes	3	...	3	3	...	6	2	...	3	2	...	2	2	...	2
Throttle glands	2	...	2	3	...	4	1	...	1	...	...	...	1	...	1
Throttle leaking	2	...	2	1	...	1	1	...	1	2	...	2	1	...	1
Throttle rigging	7	...	7	11	...	11	10	...	10	16	...	17	15	...	16
Trucks, leading, trailing, or tender	...	...	...	3	...	3	...	...	...	2	...	20	10	...	12
Valve gear, eccentrics, and rods	...	...	...	1	...	1	3	...	3	4	...	4	7	...	7
Water glasses	3	...	3	5	...	5	4	...	4	8	...	8	12	...	13
Water-glass fittings	...	...	...	3	...	4	3	...	3	3	...	3	2	...	2
Wheels	...	...	...	...	...	...	3	1	2	...	...	...	1	...	1
Miscellaneous	46	...	49	74	...	75	121	...	122	117	1	117	124	...	127
Total	169	7	184	228	10	243	341	15	361	360	16	464	419	10	439

TABLE IV—NUMBER OF STEAM LOCOMOTIVES REPORTED, INSPECTED, FOUND DEFECTIVE, AND ORDERED OUT OF SERVICE—Continued

Parts defective, inoperative or missing, or in violation of the rules	Year ended June 30					
	1950	1949	1948	1947	1946	1945
42. Reversing gear	404	405	649	528	482	439
43. Rods, main and side, crank pins, and collars	1,213	1,408	1,998	2,136	2,581	2,569
44. Safety valves	34	45	45	70	72	84
45. Sanders	641	608	597	569	784	658
46. Springs and spring rigging	2,848	3,177	4,124	4,622	5,195	4,734
47. Squirt hose	74	63	93	79	120	98
48. Stay bolts	229	227	292	318	360	351
49. Stay bolts, broken	193	196	258	283	268	308
50. Steam pipes	302	256	435	356	551	416
51. Steam valves	131	133	150	146	203	157
52. Steps	680	652	767	778	914	681
53. Tanks and tank valves	1,205	1,228	1,757	1,558	1,570	1,215
54. Telltale holes	28	33	60	69	60	78
55. Throttle and throttle rigging	664	709	923	1,026	979	948
56. Trucks, engine and trailing	580	545	812	1,005	1,261	1,151
57. Trucks, tender	540	471	652	795	1,101	974
58. Valve motion	486	484	676	778	1,080	991
59. Washout plugs	289	268	384	441	740	820
60. Stokers	261	216	270	208	....	....
61. Water glasses, fittings, and shields	907	920	1,039	1,318	1,190	1,328
62. Wheels	394	455	779	583	840	899
63. Miscellaneous—signal appliances, badge plates, brakes (hand)	652	626	707	870	1,337	1,213
Total number of defects	28,504	28,642	38,855	41,250	56,541	53,367
Locomotives reported	29,743	33,866	37,073	39,578	41,851	43,019
Locomotives inspected	66,809	85,353	93,917	94,034	101,869	115,979
Locomotives defective	6,740	7,035	9,417	10,248	11,337	11,975
Percentage of inspected found defective	10.1	8.2	10.0	10.9	11.1	10.3
Locomotives ordered out of service	399	436	654	708	690	506

TABLE V—NUMBER OF LOCOMOTIVE UNITS OTHER THAN STEAM REPORTED, INSPECTED, FOUND DEFECTIVE, AND ORDERED FROM SERVICE

Parts defective, inoperative or missing, or in violation of the rules	Year ended June					
	1950	1949	1948	1947	1946	1945
1. Air compressors	99	26	32	9	15	14
2. Axles, truck and driving	2	1	3	2	....	....
4. Batteries	20	13	8	1	2	....
5. Boilers	46	9	30	5	11	8
6. Brake equipment	673	299	204	178	102	114
8. Cabs and cab windows	377	159	90	97	46	59
9. Cab cards	75	46	37	29	24	25
10. Cab floors, aprons, and deck plates	726	234	134	130	72	60
11. Clutches	1	2	....	....	2	2
12. Controllers, relays, circuit breakers, magnet valves, and switch groups	61	35	24	14	16	18
13. Coupling and uncoupling devices	32	15	12	13	6	6
14. Current collecting apparatus	18	20	11	3	9	10
16. Draft gear	91	66	36	30	18	14
17. Draw gear	27	13	8	4	3	8
18. Driving boxes, shoes, and wedges	51	33	16	38	44	29
20. Frames or frame braces	9	5	2	7	10	12
22. Fuel system	483	191	136	66	57	45
23. Gages or fittings, air	29	11	11	10	7	7
24. Gages or fittings, steam	14	2	2	5	....	....
25. Gears and pinions	15	6	9	1	....	....
26. Handholds	70	53	32	22	18	13
28. Inspections and tests not made as required	116	90	59	78	357	297
29. Insulation and safety devices	48	36	10	11	12	17
30. Internal-combustion engine defects, parts and appurtenances	1,456	602	241	254	145	133
32. Jack shafts	8	11	5	3	4	6
33. Jumpers and cable connectors	86	8	7	1	8	9
35. Lateral motion, wheels	2	7	18	7	18	20
36. Lights, cab and classification	7	5	5	1	2	....
37. Lights, headlight	9	3	3	2	....	1
39. Meters, volt and ampere	7	....	3	3	4	2
40. Motors and generators	106	46	26	16	15	12
42. Pilots and pilot beams	29	16	23	15	8	1
43. Plugs and studs	....	....	....	....	....	1

TABLE III—ACCIDENTS AND CASUALTIES RESULTING FROM FAILURE OF LOCOMOTIVE PARTS—Continued

LOCOMOTIVES OTHER THAN STEAM AND THEIR APPURTENANCES

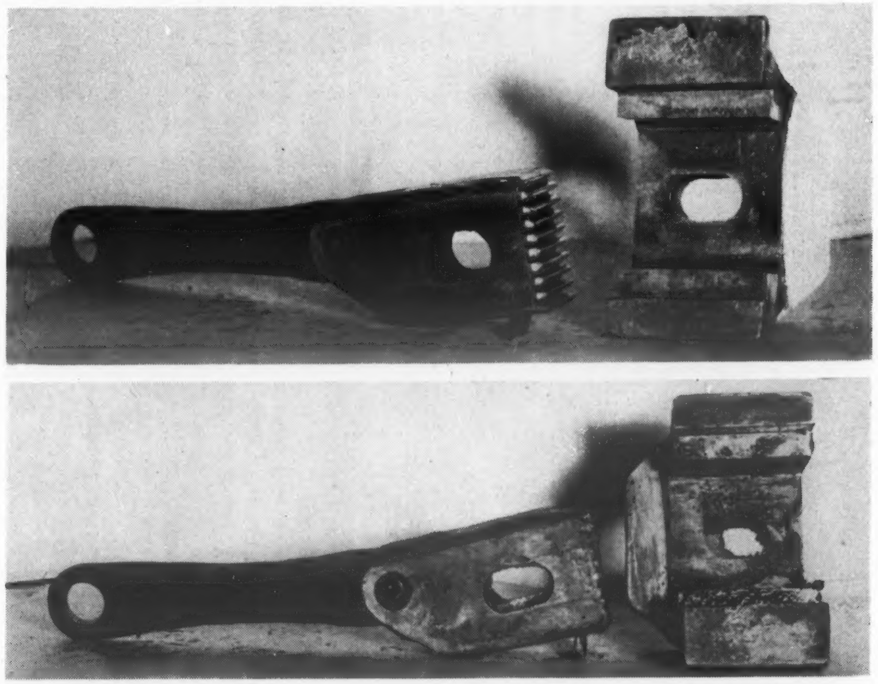
Part or appurtenance which caused accident	Year ended June 30														
	1950			1949			1948			1947			1946		
	Accidents	Killed	Injured	Accidents	Killed	Injured	Accidents	Killed	Injured	Accidents	Killed	Injured	Accidents	Killed	Injured
Brakes and brake rigging	4	...	4	4	...	5	3	...	6	2	...	2	2	...	3
Carburetors	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Couplers	1	...	1	1	...	1	...	...	...	2	...	2	...	...	...
Crank pins and connecting rods	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Fires due to overflowing or leakage of fuel, crankcase explosions, back firing, etc.	4	...	4	8	...	9	3	...	3	7	...	8	4	...	5
Generating and starting devices	1	...	1	1	...	1	1	...	1	...	...	...	...	...	...
Insulation	...	...	...	1	...	1	...	...	...	4	1	5	1	...	1
Pantographs and trolleys	1	1	...	1	...	1	...	...	...	1	1	...	2	...	2
Short circuits	2	...	2	6	...	6	7	...	7	2	...	2	2	...	2
Miscellaneous	38	2	38	27	...	43	27	...	33	22	...	22	27	...	43
Total	51	3	50	49	...	67	41	...	50	40	2	41	38	...	56

TABLE IV—NUMBER OF STEAM LOCOMOTIVES REPORTED, INSPECTED, FOUND DEFECTIVE, AND ORDERED OUT OF SERVICE

Parts defective, inoperative or missing, or in violation of the rules	Year ended June					
	1950	1949	1948	1947	1946	1945
1. Air compressors	719	693	1,007	944	1,044	1,750
2. Arch tubes	9	11	15	19	27	1
3. Ashpans and mechanism	59	52	72	87	93	81
4. Axles	1	4	8	6	7	11
5. Blow-off cocks	220	220	274	308	388	361
6. Boiler checks	386	337	424	428	526	511
7. Boiler shell	211	208	298	342	462	416
8. Brake equipment	1,845	1,806	2,617	2,512	2,992	2,755
9. Cabs, cab windows, and curtains	862	781	1,049	1,347	1,501	1,057
10. Cab aprons and decks	364	355	414	428	469	426
11. Cab cards	97	95	109	91	120	91
12. Coupling and uncoupling devices	41	42	55	58	46	57
13. Crossheads, guides, pistons, and piston rods	1,100	1,147	1,611	1,683	1,941	2,079
14. Crown bolts	53	46	78	98	88	90
15. Cylinders, saddles, and steam chests	1,160	1,155	1,617	2,004	2,217	1,801
16. Cylinder cocks and rigging	376	356	494	650	679	454
17. Domes and dome caps	90	82	142	130	164	186
18. Draft gear	368	370	461	449	536	487
19. Draw gear	280	300	413	453	462	447
20. Driving boxes, shoes, wedges, pedestals, and braces	1,037	1,070	1,582	1,580	1,922	1,803
21. Firebox sheets	181	191	302	257	333	319
22. Flues	152	156	201	197	253	260
23. Frames, tail pieces, and braces, locomotive	451	451	576	820	1,003	852
24. Frames, tender	34	39	72	63	88	97
25. Gages and gage fittings, air	116	118	185	135	185	151
26. Gages and gage fittings, steam	272	268	354	358	370	353
27. Gage cocks	386	375	474	404	495	449
28. Grate shakers and fire doors	326	286	455	444	555	558
29. Handholds	439	421	513	469	540	527
30. Injectors, inoperative	45	39	66	39	50	41
31. Injectors and connections	1,767	1,795	2,329	2,369	2,750	2,553
32. Inspections and tests not made as required	122	104	148	350	8,885	9,067
33. Lateral motion	389	507	821	791	862	977
34. Lights, cab and classification	60	58	132	155	161	167
35. Lights, headlight	131	118	183	143	168	222
36. Lubricators and shields	157	157	236	228	351	306
37. Mud rings	145	147	186	217	238	257
38. Packing nuts	558	474	456	575	691	654
39. Packing, piston rod and valve stem	510	511	658	691	776	845
40. Pilots and pilot beams	126	73	132	156	153	171
41. Plugs and studs	104	99	169	236	262	245

TABLE V—NUMBER OF LOCOMOTIVES, OTHER THAN STEAM, REPORTED, INSPECTED, FOUND DEFECTIVE, AND ORDERED OUT OF SERVICE—Continued

Parts defective, inoperative or missing, or in violation of the rules	Year ended June					
	1950	1949	1948	1947	1946	1945
44. Quills	10	9	16	18	52	29
46. Rods, main, side, and drive shafts	6	1	5	6	11	3
48. Sanders	356	151	106	82	57	50
49. Springs and spring rigging, driving and truck	103	43	44	63	42	38
51. Stay bolts, broken or defective	1	....	....	....	....	....
53. Steam pipes	32	17	10	4	1	6
54. Steps, footboards, etc	284	213	116	68	29	28
55. Switches, hand-operated, and fuses	9	1	3	1	....	7
56. Transformers, resistors, and rheostats	9	2	6	2	3	....
57. Trucks	182	84	65	45	52	42
59. Water tanks	20	2	1	2	1	2
60. Water glasses, fittings, and shields	27	2	18	....	15	2
61. Warning signal appliances	21	9	7	8	2	....
62. Wheels	95	98	72	48	54	46
63. Miscellaneous	377	109	39	40	31	16
Total number of defects	6,325	2,804	1,745	1,442	1,385	1,212
Locomotive units reported	15,719	12,692	9,803	7,805	6,616	6,094
Locomotive units inspected	42,503	30,684	20,798	13,115	10,908	9,888
Locomotive units defective	2,748	1,238	853	633	499	447
Percentage of inspected found defective	6.5	4.0	4.1	4.8	4.6	4.5
Locomotive units ordered out of service	42	20	21	19	17	16



Fouled condition of a power reverse gear latch block which stuck in raised position and failed to engage the quadrant which permitted the reverse gear to make undesired movement to position for forward motion while the locomotive was backing a cut of five cars. The top illustration shows the latch mechanism after it was cleaned and placed in proper operating condition

units propelled by power other than steam. This represents an increase of 2 in the number of accidents, occurrence of 3 fatalities, and a decrease of 17 in the number of injured compared with the preceding year.

During the year 6.5 per cent of the locomotive units inspected by our inspectors were found with defects or errors in inspection that should have been corrected before the units were put into use; this represents an increase of 2.5 per cent compared with the results obtained in the preceding year. Forty-two locomotive units were ordered withheld from service by our inspectors because of the presence of defects that rendered the units immediately unsafe; this represents an increase of 22 units compared with the preceding year.

Specification Cards and Alteration Reports

Under Rule 54 of the Rules and Instructions for Inspection and Testing of Steam Locomotives, 114 specification cards and 2,748 alteration reports were filed, checked, and analyzed. These reports are necessary in order to determine whether or not the boilers represented were so constructed or repaired as to render safe and proper service and whether the stresses were within the allowed limits. Corrective measures were taken with respect to numerous discrepancies found.

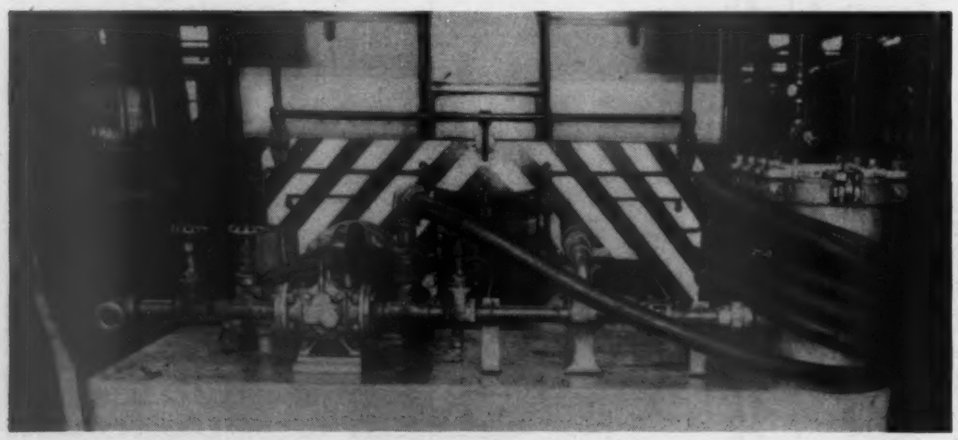
Under Rules 328 and 329 of the Rules and Instructions for Inspection and Testing of Locomotives Other Than Steam, 3,287 specifications and 1,165 alteration reports were filed for locomotive units and 564 specifications and 257 alteration reports were filed for boilers mounted on locomotive units other than steam. These were checked and analyzed and corrective measures taken with respect to discrepancies found.

Buggy Stores-Filters Drained Diesel Lube Oil

The Pegram shops of the Southern at Atlanta, Ga., is using a lubricating oil buggy which stores and filters diesel lubricating oil. It is used when repairs are needed on engines in which the lubricating oil is in satisfactory condition for additional mileage. The oil from such engines is transferred from the engine to the buggy by a pump mounted on the buggy. While the engine is being repaired the transfer pump circulates the oil in the buggy through a set of filters. When the engine repairs are completed, the same transfer pump returns the cleaned oil to the engine.

The buggy is mounted on four rubber-tired wheels 5 in. by 16 in. and has a capacity of 165 gal. It is normally moved to where it is needed by a shop truck but can be moved by hand if necessary. A gear pump driven by a 3-hp. motor is used to transfer the oil to and from the tank, and to circulate the oil through the filters. The inlet of the pump is fitted with a 50-ft. length of neoprene hose for draining or filling the engines. Fittings on the buggy are 1½-in. pipe. The piping and valve arrangement is such that oil can be pumped into the tank, then by closing the intake valve and opening the valve to the filter compartment, the oil can be filtered within the cart. The engine is refilled by reversing the gear pump.

The tank on the buggy is 38 in. by 80 in. by 17 in., and is constructed of ⅜-in. plate. The filter compartment is 10 in. by 36 in. by 18 in. high and holds five Michiana circular filters. This compartment is fitted with a vent on top to aid in draining the oil when the filters are to be changed, and to exhaust the displaced air during filling. The filters are protected by a 30-lb. by-pass valve and by sight glasses. A sump in the shape of a segment of a circle with a 6-in. radius extends across the entire width of the tank. The pump takes its suction from the sump, and can thereby drain all of the oil within the tank. The sump is welded to the bottom of the tank, and is 2 in. deep and 5 in. wide.



Buggy for storing and filtering diesel lube oil while repairs are being made to the engine

Single Layout Cleans and Tests Coils

The cleaning and testing of Vapor steam generators is performed at a single location with a single set-up at the Pegram shops of the Southern at Atlanta, Ga. City water and water pressure are used for the flow test, delivery being made through 1-in. piping mounted on one wall of the shop. An acid bath pump is located adjacent to this city water piping, and connected to it through valves, so that only one set-up is required for both testing and cleaning the coil. Should a coil fail to pass the first flow test after cleaning, it does not have to be removed for re-hammering, recleaning and retesting.

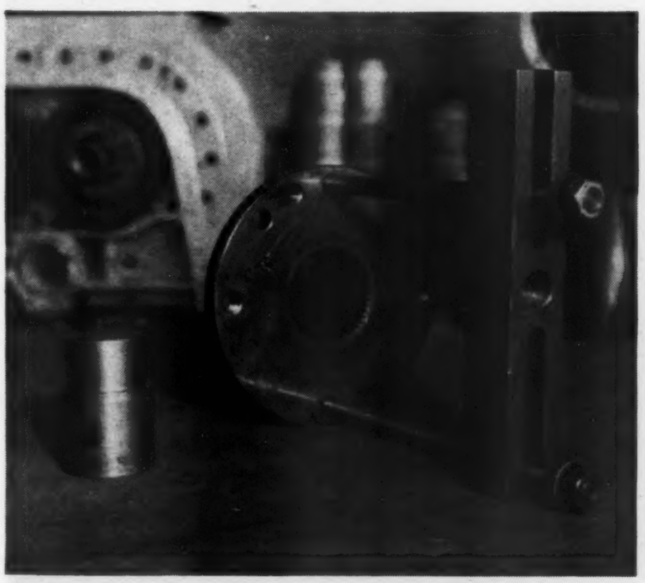
Each of three coils in the generator set is tested separately. The test is conducted by throttling the outlet to attain a flow of 10 g.p.m. The pressure drop is measured by a gage, one line of which is connected to the water inlet and a second to the water outlet. With this arrangement the pressure drop through a new, clean, unrestricted coil is about 22 p.s.i. After a term of service

Compact arrangement for cleaning and testing steam generator coils

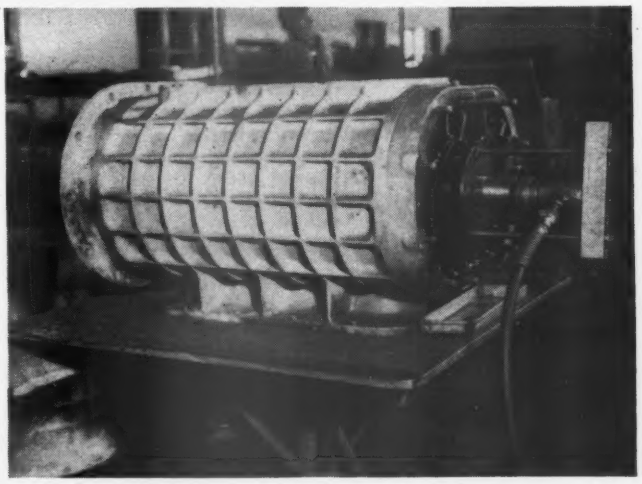
this increases to from 25 to 35 lb. After the initial test the coil is scaled and cleaned with Pennsalt 90, and the pressure drop test repeated. If this test shows a drop greater than 26 p.s.i., the coils are recleaned with the solution and hammered. If after the second cleaning the pressure drop still exceeds 26 p.s.i., the coil is discarded. Coils which pass the pressure drop test are given a hydrostatic test of 1,200 p.s.i. generated by a second pump in the immediate vicinity.

Simple Puller for Blower Gear Flanges

The combination gear flange and lobe bearing on diesel engine blowers is removed safely and quickly by means of the pulling arrangement illustrated. The device is used



The apparatus for removing blower gear flanges with a foot-operated hydraulic pump



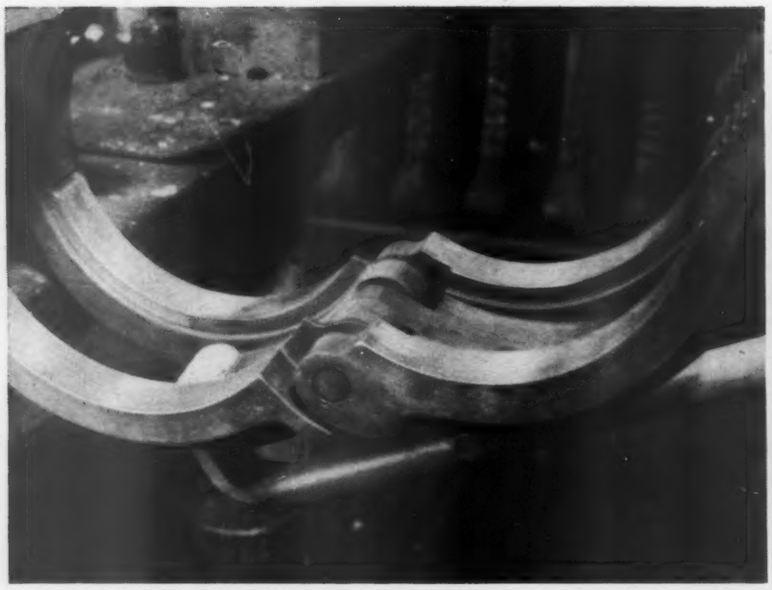
Pulling arrangement in place for removing blower gear flange

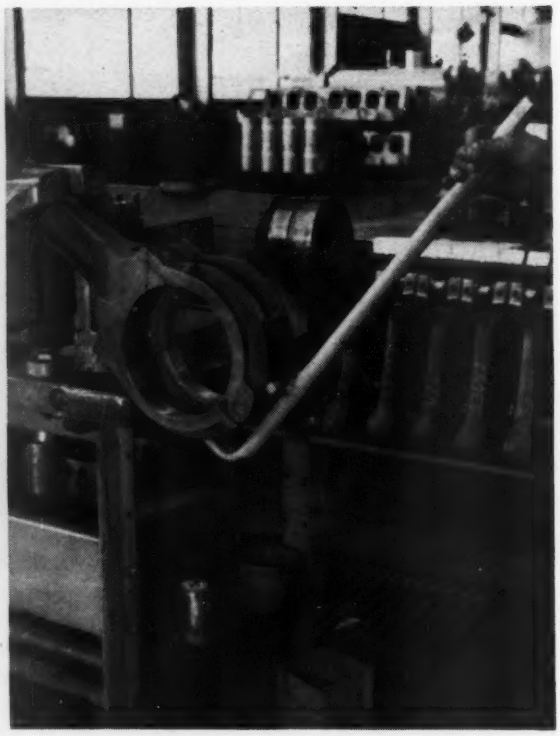
in conjunction with a hand-operated hydraulic pump, and it consists of a pair of studs that screw into the gear flange on one end and are secured to a pulling piece on the other end with nuts and washers.

After the studs are screwed into the gear flange and the backing-up piece placed at the opposite end of the studs, the hydraulic pump is placed with the blind end against the backing up piece and the ram end applying the force to remove the flange through a filler piece.

Lever Simplifies Basket Application

An easily made lever is used at a western railroad shop in lining up diesel engine baskets for the application of the cap screws when the rod is in place in the engine. The lever has a hook at the bottom end which contacts the web of the basket opposite to the one being forced into place. A $\frac{5}{8}$-in. rod, 4 in. long, is welded on the lever a short distance up from the bottom to give proper contact for forcing the basket into place.





How the lever (left) is used to align the second side of a basket when the rod is in place on the engine. The bottom of the lever (above) showing how the hook is placed on the bottom web of one basket while the short rod contacts the second basket to force the latter into place

The rod is used for putting the last side of the basket in place only. The first side is secured in place by hand, there being no resistance to lining this side up. After the first side has been applied and its cap screws tightened, the lever forces the second side in place for lining up the cap screw holes and holds the second side in place with the holes aligned for applying the cap screws.

Facing Bottoms of Cylinder Heads

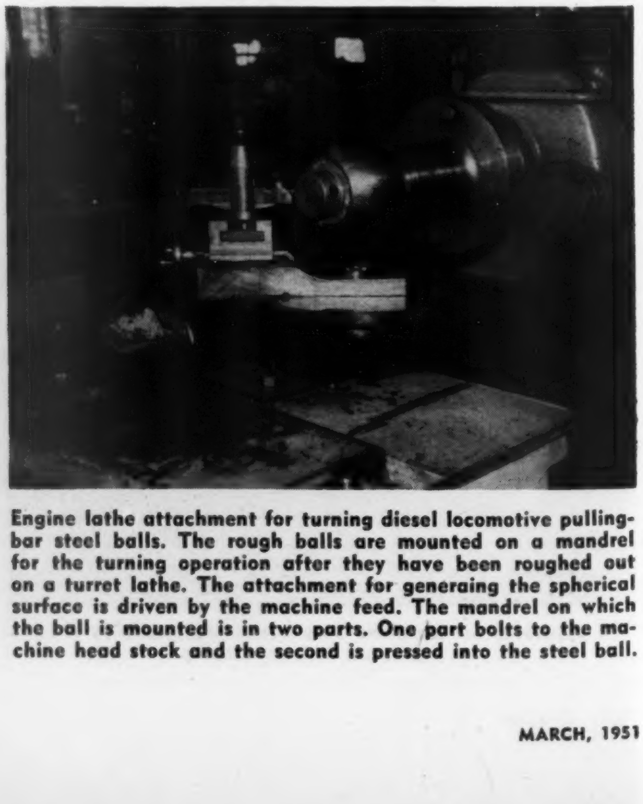
The bottoms of cylinder heads are lapped seven at a time at the West Burlington, Iowa, shops of the Chicago, Burlington & Quincy. A boring mill equipped with two circular plates equal in diameter to the table is used for the job, which takes about 20 minutes of lapping time. The lapping is done with the use of oil and powdered emery.

The bottom plate is bolted to the table and is lined with approximately $\frac{3}{4}$ in. of babbitt which is faced off in position. It also has an eccentric boss at the center of the table that extends through the top plate. The top plate is held stationary by a bar that is placed in the ram of the boring mill and, as the boring mill table revolves, the heads oscillate approximately $1\frac{1}{2}$ in. and at the same time turn about a larger radius; friction created on the outside of the table rotates the heads.

This lapping operation is performed on all heads, whether they have been machined or not, in order to create a better bearing and eliminate water leaks.

* * *

Boring mill adapted for facing the bottoms of seven cylinder heads simultaneously in 20 min.



Engine lathe attachment for turning diesel locomotive pulling-bar steel balls. The rough balls are mounted on a mandrel for the turning operation after they have been roughed out on a turret lathe. The attachment for generaing the spherical surface is driven by the machine feed. The mandrel on which the ball is mounted is in two parts. One part bolts to the machine head stock and the second is pressed into the steel ball.

QUESTIONS AND ANSWERS

Diesel-Electric Locomotives

Miscellaneous Equipment

141-Q.—What is the function of the load meter? A.—It is used by the engineer as a guide for the operation of the throttle during motoring, and the selector handle in the braking range if dynamic braking is furnished.

142-Q.—What is gained by careful observance of this meter? A.—The engineer may get the maximum loading from the locomotive and guard against abusive overloading of the traction motors.

143-Q.—Which locomotives are equipped with the load meter? A.—Each *A* unit and road switcher locomotive is so equipped.

144-Q.—How many types of load meters are in use? A.—Two types of meters are in use. One is designed with the outer scale divided into three colored zones, the other is divided into two colored zones with the last zone marked off in minutes.

145-Q.—Describe the inner scale. A.—The inner or braking scale is divided into zones, white: 0 to 800 amperes and red: 800 to 1500 amperes.

146-Q.—With reference to one type, what do the figures denote? A.—A set of white figures outside the outer scale indicates the amperes in hundreds. A set of yellow figures in between the two scales indicates the time in minutes.

147-Q.—What is the purpose of the outer scale? A.—The outer scale is known as the *motoring scale.*

148-Q.—Describe the motoring scale. A.—This scale is green from 0 to 1.085 amperes, which is the continuous rating of the traction motors. In this zone the operation is unlimited. From 1,085 to 1,500 amperes the scale is yellow, indicating limited operation. The yellow figures beneath this part of the scale indicate the time in minutes the loads may be maintained.

149-Q.—Is the operating time in this zone accumulative? A.—No. When the locomotive has been operated at any of the overloads for the full time shown, or a combination of the overloads (for example, part time at the 10 min. rating and part time at the 20 min. rating) the load must be reduced into the white zone, 1000 amperes or less for 20 minutes.

150-Q.—What time must elapse before an overload is repeated? A.—One hour.

151-Q.—What can be determined by this guide? A.—By this guide the engineer can determine quickly when an overload condition arises. It will indicate whether he can reach the top of the grade or into the next siding within the overload time limit, or if he should stop immediately and reduce tonnage, double the hill, or obtain the assistance of a helper locomotive.

152-Q.—What is the purpose of the inner scale? A.—The inner or braking scale is used as a guide for the operation of the selector handle when using dynamic braking.

153-Q.—What kind of an operation is permitted in the white zone? A.—Continuous operation may be had for any pointer position within the white portion of (except as described in another section under Dynamic Braking Limit).

154-Q.—What is the meaning of the red portion of the scale? A.—Any position of the pointer in the red portion of the scale indicates an overload which must be reduced immediately to prevent possible damage to the braking grid assembly.

155-Q.—On the other type of load meter with the three colored zones in the outer scale, what does the red zone indicate? A.—The red zone at the high current end of the scale represents a heavy overload.

156-Q.—When is operation in this zone normally used? A.—For starting and accelerating the train.

157-Q.—How many minutes would be required in this zone for such operations? A.—A train of the proper tonnage should not require more than 4 minutes operation in this zone.

Schedule 24 RL Air Brakes

Overspeed Protection Feature—H-24-C Relayair Valve Unit *(continued)*

1064-Q.—What is the immediate result of air flowing into the overspeed actuating pipe 1? A.—The overspeed whistle immediately blows, indicating that an overspeed application is initiated.

1065-Q.—What additional flow of air takes place from the overspeed actuating pipe 1? A. — Air also flows through the choke in the check valve to the overspeed volume reservoir and chamber *E* of the overspeed application valve.

1066-Q.—What takes place if the train speed is not reduced? A.—If the train speed is not reduced below the overspeed setting to re-energize the FA-4 magnet valve in approximately 6 sec., air from the magnet valve flowing through the check valve builds up in the overspeed volume reservoir and in chamber *E* of the overspeed application valve.

1067-Q.—What movement results from build up of air in chamber E? A.—Diaphragm *10* and diaphragm follower *5* are moved downward to seat valve *17* and unseat valve *15*.

1068-Q.—Describe the flow of air further? A.—Air from chamber *B* on top of brake valve application piston *112* is quickly vented through passage *10*, pipe *10*, passages *17*, *7* of the overspeed application valve, past unseated valve *15* to chamber *F* and out exhaust passage *6* to atmosphere.

1069-Q.—What prevents build up of air from chamber A under the service application piston 112 to chamber B

above the piston? A.—Choke K. in the service application piston prevents this build up as long as exhaust valve *15* in the overspeed application valve is unseated.

1070-Q.—What results from the escape of air from chamber B faster than it can be supplied? A.—The service application piston moves upward to "*application*" position.

1071-Q.—How does the emergency application portion function (if used)? A.—If the speed is not reduced and an overspeed application is initiated, the emergency application portion functions as explained under safety control.

1072-Q.—How many relayair valve units are used with the H-24-E Relayair Valve? A.—Two, Cut-Off Valve and Overspeed Application Valve.

1073-Q.—What additional unit is supplied for the H-24-C Relayair valve Unit? A.—An Overspeed Suppression Relayair Valve.

1074-Q.—How does it function? A.—It operates to suppress an overspeed brake application when the brake valve handle is placed in FIRST SERVICE POSITION (Rotair valve in FRT. position) or when a light service application is made.

1075-Q.—Is this suppression permanent? A.—No. This will cause a 20-second suppression after which time the brake valve must be placed in service position for further temporary suppression or the speed reduced below the speed allowed.

1076-Q.—What will cause a permanent suppression? A.—About 15 lb. service reduction which will operate the cut-off relayair valve.

1077-Q.—When charging, how does the air flow through the H-24-C Relayair Valve Unit. A.—From pipe *10* through the cut-off valve of the H-24-C Relayair valve through the overspeed suppression valve to passage *7* and to the overspeed application valve.

1078-Q.—What happens when an overspeed occurs? A.—If the train speed is not reduced below the overspeed setting to re-energize the Fa-4 magnet valve in approximately six seconds, the parts function as described for the H-24-E Relayair valve unit except that the air passes through speed application valve.

1079-Q.—Describe the operation to initiate a temporary suppression of an overspeed (Service application used) Portion. A.—As previously stated, this is accomplished by placing automatic brake valve handle in First Service position (rotair valve in FRT. position) or service position before the six second warning time has elapsed. This admits air through the brake valve rotary valve and seat into either the *26* or *17* line to the top of the overspeed suppression valve diaphragm *10*

Steam Locomotive Boilers

By George M. Davies

Tapered Shell Courses

Q.—On the older types of steam locomotives, the boiler invariably has a pronounced taper in one of the shell courses. What was the reason for designing the boilers in this manner?—F. R. E.

A.—The application of the conical course in the older type of locomotive boilers was usually brought about by the necessity of distributing the weight of the locomotive. This weight distribution generally required a reduction of the front-end weight of the boiler which was accomplished by reducing the diameter of the boiler at the front end, limiting the diameter of the front tube sheet to that required for the application of the dry pipe, tubes and flues, thus making the diameter at the front of the boiler considerable smaller than the diameter at the firebox end, thus, a conical or tapered connection was required in the shell between the firebox and the front tube sheet.

Grooving in Seams

Q.—What is the cause of grooving along the bottom of the circumferential seam of a locomotive boiler; the grooving generally starts in the shell plate along the inside caulking edge of the circumferential seam and always at the bottom?—R. K. J.

A.—Grooving along the inside of the shell plate at the inside caulking edge of the circumferential seam, particularly at the bottom of the boiler is due to expansion and contraction of the boiler shell, generally due to the uneven stresses that are set up due to the water in the bottom of the boiler having a lower temperature than the water and steam at the top, which results in the length of the boiler at the top becoming greater than the length at the bottom causing the barrel of the boiler to bow. This action is continual and eventually weakens the metal at the edge of the circumferential seam, at which point a hinge action takes place, this stressing of the plate, combined with the action of the water, causes the plate to deteriorate with the resultant grooving of the plate. The same stress condition also exists along the outside caulking edge but since there is no water action to combine with the stresses set up due to the expansion and contraction of the shell, deterioration of the plate does not develop.

Holes in Welded Seams

Q.—Is it permissible to drill holes through the welded seams of an all welded locomotive boiler?—F. W. P.

A.—It would not be permissible to drill holes in the longitudinal seam of an all-welded boiler, in that, the general practice on such boilers is to base the allowable working pressure on a welded joint efficiency of 90 per cent of the lowest tensile strength of the plate. This joint efficiency is for a continuous welded seam and makes no provision for a possible ligament efficiency that would result from drilling holes in the welded seam.

The A.S.M.E. Code provides that unreinforced holes may be machine-cut through welded seams that have been stress-relieved and radiographed. The joint efficiency as well as the ligament efficiency shall be considered in calculating the thickness of the plate.

Which Joint?

Q.—In butt welding plates 3/8 inch or over in thickness, should the single or double vee butt joint be used?—E.M.E.

A.—The single or double vee butt joint is suitable for welding plates 3/8 inch or over in thickness for all usual load conditions. The double vee butt joint is generally used for plates of greater thickness than the single vee and for work which can be welded from both sides. The cost of preparation for double vee joints is greater than for the single vee but the double vee requires approximately half as much electrode to make the weld.

All other considerations being equal, the cost of machining the weld, plus the cost of electrode for both the single and double vee weld should be computed and the joint selection made accordingly.

ELECTRICAL SECTION

Twelve-Volt Caboose Power for Radio

Missouri Pacific's large scale train communication program made economically practicable by the adoption of 12-volt caboose radio power plants

The generator, rectifier and voltage regulator

PROJECTS in service and authorized on the Missouri Pacific will result in the application of radio train communication equipment to 15 steam locomotives, 122 diesel-electric locomotive A units, 110 cabooses, and 12 wayside stations on 1,540 miles of road.

The overall costs for train communication were decidedly reduced, in 1950, by adopting radio on the cabooses which operates on 12 volts d.c. The reduction in the cost of power supply on each caboose, to approximately $700 installed, is one of several factors that made it practicable to install train radio communication extensively on this road.

The radio equipment on the cabooses operates on a 12-volt d.c. power supply. This energy is supplied by two 6-volt, 240 amp.-hr. lead acid batteries, which are charged by a Leece-Neville belt-connected, axle-driven, a.c. generator, Model 5150G6, rated at 14 volts, and maximum of 75-amp. output. This machine cuts in at 8 m.p.h., and above that speed it feeds through a dry-plate rectifier, Model 1004-C, and a Model 3256R6 regulator, also furnished by Leece-Neville, to charge the storage battery.

A multiplying V-belt drive, developed by the Dayton Rubber Company, is used to drive the generator.

View under a caboose showing the axle-pulley, one of the two idlers in front and above, the jack shaft with its multiplying pulleys and the second pair of belts running to the generator mounted on the caboose floor

Vibrator converter supplies 180-volt plate current to the radio

The pulley on the car axle is 19 in. in diameter and 10 in. wide. The backs of the duplex V-belts run on this axle pulley. The faces of the V-belts run on two idlers, one ahead and one to the rear of the axle pulley, and the V-belts also go up over a pulley on a fixed shaft that has a second pulley with two belts that go up through the floor of the caboose to the pulley on the shaft of the generator. At 10 m.p.h. the generator rotates at about 680 r.p.m., and at 40 m.p.h. about 2,720 r.p.m.

On each diesel locomotive A unit, the radio and power supply are complete and independent, so that these A units can be switched around to meet requirements for road service without any changes in the radio. On each locomotive A unit, power is taken from the starting battery to operate a Cornell-Dubilier Model 3264 vibrator converter to furnish 115 volts a.c. A power supply, included as part of the radio equipment, converts the 117-volt a.c. to the proper transmitter and receiver plate and filament voltages.

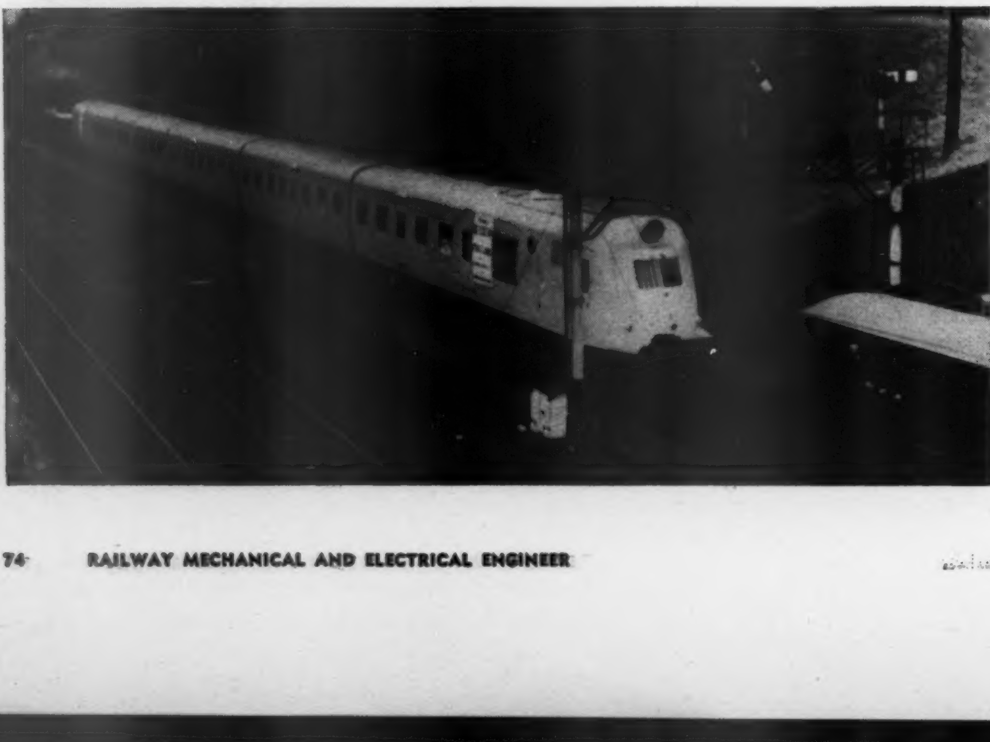
On the caboose the radio receiver and transmitter filaments are connected directly across the 12-volt storage battery. Receiver plate voltage of 180 volts d.c. is supplied by a synchronous vibrator fed from the 12-volt storage battery. Transmitter plate voltage of 420 volts d.c. is supplied by a small dynamotor actuated from the 12-volt storage battery when the push-to-talk button in the handset is pressed. These dynamotors are made by the Carter Motor Company, and have a rated output of 420 volts, d.c., 0.280 amp., at 5,700 r.p.m. The discharge from the battery, when receiving is approximately 11 amp.; and when transmitting, about 30 amp.

The train radio equipment installed on the Missouri Pacific in 1950 is the FMTU-80 type made by Motorola, Inc. The same type of equipment is used interchangeably in locomotives, cabooses and fixed wayside offices. At present, all road freight train radio equipment, locomotives, cabooses and way stations operate on the Missouri Pacific's assigned end-to-end frequency of 160.41 mc. However, plans are under way to adopt a dual-frequency system to eliminate interference between mobile and way stations, which is expected to result from the increase in radio equipment to be installed in 1951, and from additional base stations to be installed later. Crystal oscillator switching will be used as base stations and on mobile units to eliminate necessity for dual equipment and its resultant increase in power plant drain.

Records kept of an early installation on this railroad indicated that radio equipped trains moved over a specified 100-mile engine district on an average of 30 minutes faster than non-radio equipped trains. The same records indicated a virtual elimination of train break-in-twos due to air being set from the rear end of freight trains on account of hot boxes or other circumstances. These are the principal reasons the Missouri Pacific decided to expand its freight train radio communication system.

The radio installations on the Missouri Pacific were planned and installed by railroad forces under the direction of W. Rogers, superintendent telegraph, and R. A. Hendrie, assistant superintendent telegraph, and under the direct supervision of L. E. Verbarg, telephone engineer.

* * *



One of the two diesel-electric articulated trains recently built for the Egyptian State Railways by the English Electric Company Ltd. The two trains are the first part of an order for ten similar trains, totaling £3,000,000 Each train will accommodate 172 first and second-class passengers. They are capable of speeds up to 75 m.p.h. and they will operate between Cairo and Alexandria, Egypt, on a schedule of a little over two hours for the 130-mile trip

Train Performance Calculator*

The Pennsylvania develops electro-mechanical brain for computing the optimum performance of all kinds of motive power

Front view of the new train performance calculator

An electro-mechanical train performance calculator was recently placed in service by the Pennsylvania in Philadelphia, Pa. By means of measuring and recording instruments, this device quickly computes and records information required to determine the economics, schedules, and proper tonnage ratings for all types of motive power. Such information was previously assembled from a large number of tedious, step-by-step mathematical calculations. This machine performs and records the necessary calculations for a high-speed passenger train in actual train running time.

The procedure generally followed to calculate the performance of a given train over a given route is first to assemble pertinent data relating to motive power tractive effort, train resistance, effective track grade operating restrictions, and schedule stops. Next, train acceleration at any speed and the limitations on use of acceleration are determined. Thereafter, the principles of mechanics are applied to calculate step by step the speed developed, the time required. and the distance covered by the train as it is assumed to move along a selected route. Step-by-step calculations are tedious and consume considerably more time than the actual train would need to operate over the route.

In this calculator, net acceleration is expressed as a small voltage. As this voltage is measured, it is mechanically integrated with respect to time to control a second voltage proportional to speed. Speed voltage is, in turn, measured and integrated with respect to time. The speed integrator, through relays, controls the speed of a motor to advance a chart at a rate proportional to distance covered.

The basic elements of the calculator are three: self-balancing, potentiometer-type, curve-drawing instruments, electricially interconnected, and a low-energy auxiliary circuit, all of which are mounted on two steel panels. The auxiliary circuit contains apparatus necessary to represent effective forces which influence the movement of the train and to simulate three types of train motion: acceleration, operation at fixed speed, and braking. All the electrical energy required to operate the machine is supplied through two 3-amp. fuses from the 110-volt office lighting system.

Instruments

The three instruments are an acceleration recorder, a speed recorder, and a distance recorder. These instruments, as well as the auxiliary apparatus, were previously developed for other applications and have been adapted to the calculator with no changes in basic design.

The acceleration recorder measures a voltage proportional to the totalized motive power and track acceleration forces, or to the braking force, and provides a permanent record of train acceleration at any time. A pointer attached to the recording pen carriage indicates instantaneous acceleration along the lower instrument scale which is calibrated from minus 2.4 to plus 2.4 m.p.h. per sec. A mechanical integrating device operates in conjunction with the acceleration measuring mechanism and moves a contact over a straight section of slidewire, located behind the upper instrument scale. This contact is attached to a pointer which indicates speed on the upper instrument scale calibrated from 0 to 120 m.p.h. The straight slidewire transmits to the speed recorder a voltage proportional to speed.

The speed recorder measures this voltage and provides a record of train speed at any time. A pointer associated with the pen indicates speed on a scale calibrated from 0 to 120 m.p.h. This instrument contains two retransmitting slidewires and a mechanical integrating device which are positioned by the speed measuring mechanism. One slidewire transmits to the acceleration recorder a voltage proportional to acceleration; the other transmits to the distance recorder a voltage proportional to speed. An integrating device, through relays and cam-actuated contacts, regulates the speed of the special chart-drive motor in the distance recorder.

The distance recorder measures speed and provides a permanent record of speed on a prepared chart which

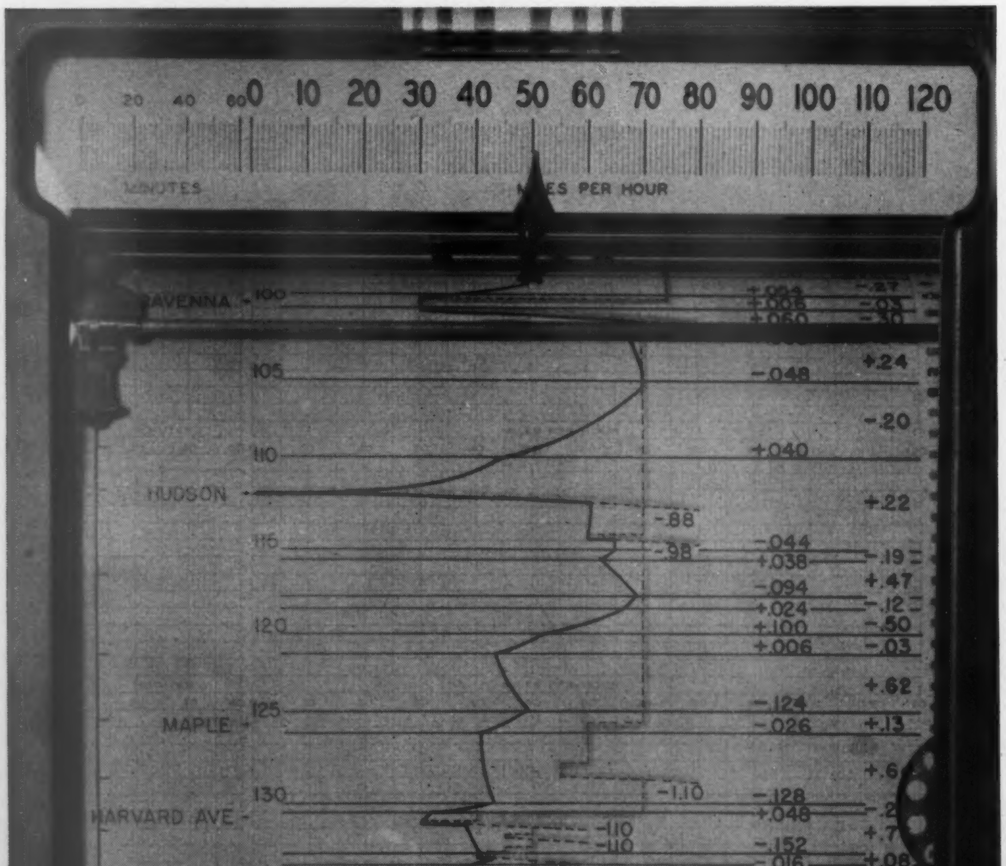
represents the track. A curve-drawing pen represents the train. A pointer moving with the pen indicates speed along the right-hand section of the instrument scale, calibrated from 0 to 120 m.p.h. A solenoid-operated pen, located under the left-hand section of the scale and actuated by a timing motor, provides a permanent record of time by drawing short horizontal lines at five-minute intervals. The left-hand sections of the scale and the chart are ruled from 0 to 60 minutes. This portion of the chart is completed manually, to show time in hours and minutes at any location, following conclusion of the calculation. The special chart-drive motor advances the chart in steps of 0.02 in. for each 0.1 mile of calculated performance.

Operation

Prior to making a calculation, the known data must be prepared and placed in the machine. The track information is plotted to scale on the speed distance portion of the chart in the distance recorder. It consists of effective track grades, equivalent acceleration values, speed restrictions, braking lines, required braking acceleration values, mileage designations, stations, and interlockings. The train information is reduced to terms of net acceleration on level tangent track. This information is translated into proportional voltage by adjusting rheostats, most of which are connected between fixed positions along a slide wire which is positioned automatically by the speed measuring mechanism.

After the known data have been placed in the calculator, the power switch is turned on. Calculation and recording are fully automatic except for changes of track grade and for changes in type of motion. This information is supplied to the calculator by adjustment of a rheostat to regulate a voltage proportional to the acceleration produced by effective track grade (or proportional to the retardation required for braking) and by operation of a three-position switch to simulate type of motion. Progress of the speed trace on the prepared distance chart determines the nature and extent of each adjustment. One man can handle both adjustments without difficulty. He must, however, carefully follow the speed trace and other indications on the speed-distance chart.

The train performance calculator has been used extensively by Pennsylvania engineers to analyze and to predetermine performance of Diesel-electric, straight electric, and steam locomotives, and of multiple-unit cars.



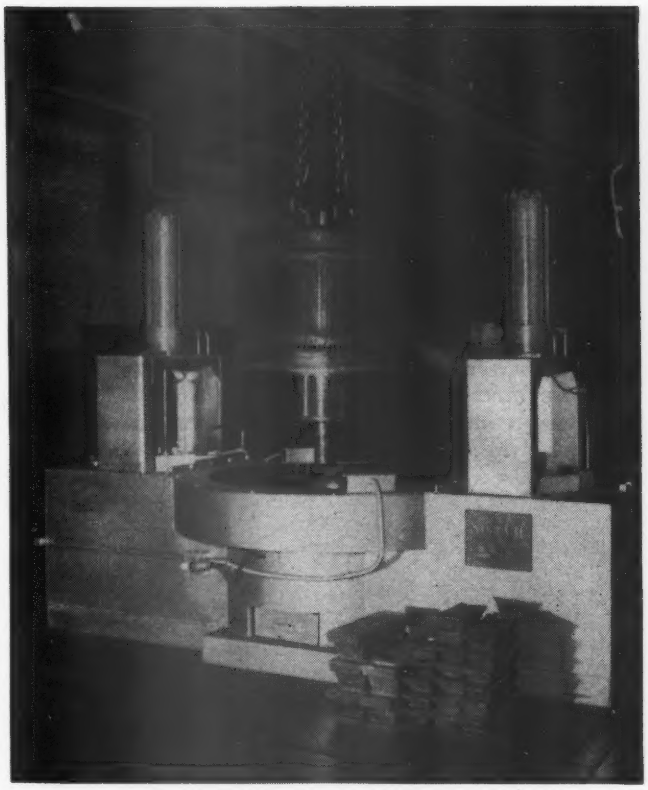
Speed-distance chart in the distance recorder. A number of road tests under specified conditions have been confirmed with the calculator

It is particularly effective in making comparisons between different types and sizes of motive power on the same train. No special allowances are necessary for track conditions, locomotive handling, or equipment defects, the results being wholly dependent upon information supplied. A number of road tests under specified conditions have been confirmed with the calculator. Momentum operation of long freight trains on short ruling grades and the use of short-time ratings on electric propulsion apparatus have been investigated to a much greater extent than was considered practicable with step-by-step calculations. Noiseless operation and simple controls make the new train performance calculator a valuable addition to a modern railroad engineering office.

Burlington Pot-Solders Diesel Generators

The Chicago, Burlington and Quincy has recently installed in its West Burlington, Iowa shops, an electrically heated commutator soldering machine, for soldering commutators of rewound diesel-electric main generator armatures. The Burlington was one of the first railroads to use this method, having employed a smaller, shop-made machine on traction motors since 1942.

The type solder used is block tin and the machine is capable of soldering all main generator armatures in service on the Burlington by the use of various sized adapters. The tin is melted by two resistance-type electrical heaters at each end of the machine, and after the armature is lowered through the ring against an asbestos gasket, the solder is lifted into the center portion against the risers by lowering steel plugs into the two solder containers.



Generator armature soldering machine used in the West Burlington Shops of the C. B. & Q.

The machine shown is a Stewart Sunbeam commutator soldering machine, manufactured by the Industrial Furnace Division of the Sunbeam Corporation, Chicago.

* * *

Swiss electric snowplow, mounted on a single truck, is equipped with its own turntable and may be turned by two men. Power for motors driving the rotors is supplied by cables from the electric locomotive which pushes the plow. This type rotary snowplow clears the snow over a width of 10¼ ft., at a speed of one to six m.p.h., and can throw the snow either to the left or to the right

CONSULTING DEPARTMENT

Can you answer the following question? Answers should be addressed: Electrical Editor, Railway Mechanical and Electrical Engineer, 30 Church Street, New York 7.

Proper maintenance of diesels requires facilities, material and skilled men interested in the work. How can morale be made an active factor in the diesel shop?

Winding insulation
Tester for D. C. Armatures

Can you tell me how the General Electric surge tester for traction motor armatures works, showing a diagram of the circuits involved, and also tell me just what information it gives to the man making the test?

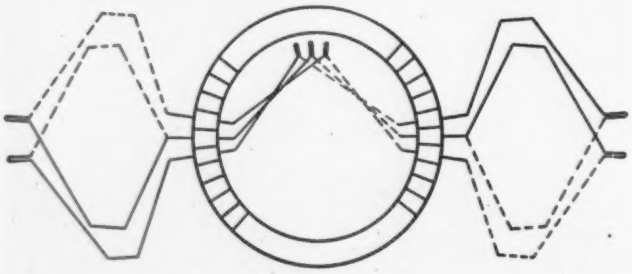


Fig. 1—Simplified connections for two coils of a parallel-wound, equalized armature

The General Electric surge tester for traction motor armatures represents a new application of this method of testing. It is a quick and effective means of determining the adequacy of turn-to-turn insulation so essential to dependable transportation motor armatures. It makes possible reliable tests at voltages considerably above operating levels.

Conventional induced voltage tests, such as used on series wound armatures, are not applicable to transportation motor armatures with their parallel winding. This is evident from an examination of Fig. 1, which shows the simplified connections for two coils of a parallel wound equalized armature. The success of the repetitive type surge test on high impedance windings suggested that it might be adopted to low-impedance armature testing.

A low-impedance surge tester was built and successfully used during World War II. However, its capacity was definitely limited by the current capacity of the thyratrons then available. Adequate testing potentials for transportation motors of post-war design required currents far in excess of thyratron capacity. Experimental testers of high-current capacity were tried and finally a successful tester was built, using ignitrons.

Fundamentally, the surge generator for this tester consists of a capacitor (C in Fig. 2) charged to some predetermined voltage through a rectifier tube during one-half cycle of the power supply. The capacitor is then discharged into the winding under test during the other half cycle of the power supply. This sequence is repeated as long as power is supplied to the circuit.

Coaxial cables are used to conduct the surge current to the winding under test to reduce the impedance in the surge circuit. The transformer primary supply is adjustable to allow proper selection of test potentials.

Two ignitrons are used, connected in inverse parallel, or "back-to-back", to insure complete oscillatory discharge of the capacitor. Ignitron firing is accomplished by discharging the capacitors C_2 and C_3, which are charged during the same part of the power cycle as the surge capacitor, through thyratrons T_1 and T_2 into the ignitors to start the conducting arc.

Thyratron grid control consists of a 30-volt negative bias modulated by a 60-cycle voltage of about 250 volts on the thyratron firing the inverse ignitron and a lower 60-cycle voltage modulating the grid of the forward firing circuit. The inverse ignitron is fired first to assure the existence of an arc for the first inverse surge after the foward ignitron is made conducting. An inductance L, in series with the surge current, provides a small voltage to initiate the oscilloscope sweep circuit and insure perfect synchronization.

Fig. 2—Wiring diagram of the surge generator

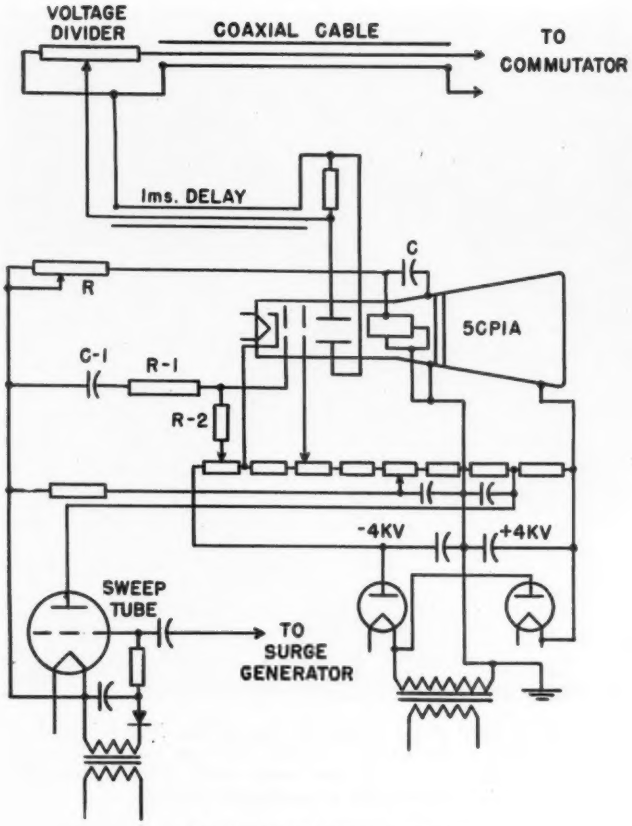


Fig. 3—Oscilloscope circuits

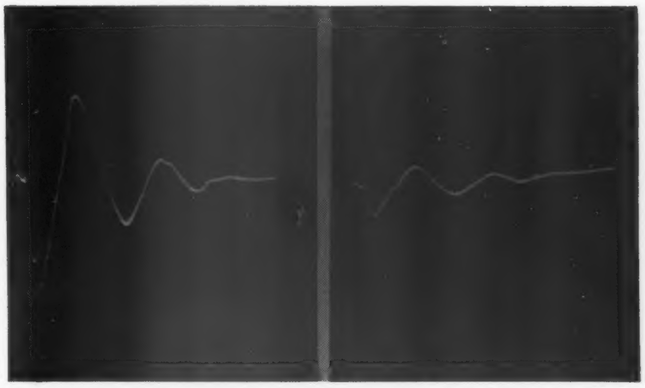


Fig. 5—(left) Surge wave on a very low impedance armature. Fig. 6—(right) Effect of a deliberate short placed between the commutator segments at the equalized connection

The oscilloscope circuits are shown in Fig. 3. The sweep tube is a small thyratron and serves two functions. It provides a positive potential on the intensity grid to initiate a trace beam, and also provides sweep potential.

The time axis of the sweep is controlled through a variable resistance *R* which changes the charging rate of capacitor *C*. Because the surge current triggers the sweep current, it was found necessary to place a two-microsecond delay cable in the vertical deflection plate circuit to assure recording the first surge peak.

A special fixture holds the surge contacts and the measuring contacts. Two shorting contacts are also incorporated in it. The purpose of the shorting contacts is to short the commutator segments approximately one pole pitch to prevent the build-up of induced voltage to excessive values. The shorting contacts have interlock switches that are in series with interlock switches in the fixture handles. Surge power cannot be applied until the shorting contacts are in place and both hands of the operator are in position, as shown in Fig. 4. This prevents accidental contact with conductors connected to the surge circuit.

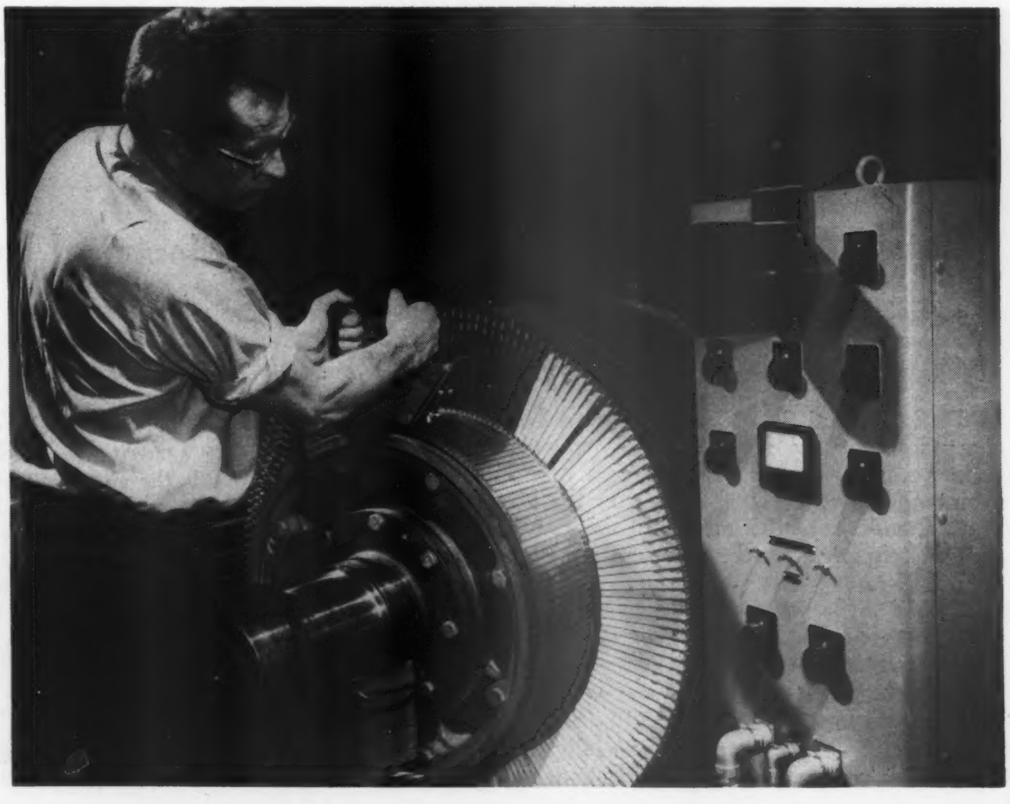


Fig. 4—The newest type of General Electric surge tester. No voltage can be applied to the armature until the operator's hands are in the position shown

An oscillogram of a surge wave on a very low impedance armature is shown in Fig. 5. It is a typical surge shape; has a peak value of 500 volts on the first surge; a frequency of approximately 200 kc.; and surge current crest value around 1,500 amp.

The effect of a deliberate short placed between the commutator segments at the equalized connections is indicated by Fig. 6. The voltage of the surge is approximately 100 volts. No attempt was made to measure the crest value of the surge current.

A pilot model of this surge tester has been in use at the Erie Works of the General Electric Company for about one year. The current limitations have not been determined as the tester has been able to handle any armature now manufactured and still it has sufficient reserve capacity to provide tests at higher voltages if desired. Maintenance has been extremely low compared to the previous thyratron powered tester.

Experience to date indicates that the tester is simple, rugged, and has ample voltage and current capacity to adequately test a wide variety of apparatus. Its voltage range is from less than 100 volts to 7,500-volt peak. It is not limited to d.c. motor armatures, but has been used on field coils up to 100 turns, stator coils, and other work of similar nature.

The newest tester is shown in Fig. 7. It is expected that it will find an expanding field of use as application experience is gained, and point the way to improved design and manufacturing techniques.

F. H. Catlin
General Electric Company

Diesel-Electric Locomotive Batteries

Questions and Answers

Q.—What should be done after receiving a new battery?

A.—When a new battery is received, the Electric Storage Battery Company recommends that it be examined for loss or spillage of electrolyte en route. Remove the vent plugs and note the height of the electrolyte. The electrolyte level of all cells should be ⅛ in. below the bottom of the filling tubes, unless some has been spilled during shipment. If there is any evidence of spillage, restore the level by adding electrolyte of the same specific gravity as that in the other cells. If no electrolyte is on hand, add approved water, and make a notation to this effect in the battery record.

Check the specific gravity of the electrolyte as shown in the figure. If it is 20 points or more below the fully charged gravity as shown on the nameplate, give the battery a freshening charge. Charge at the finishing rate shown on the nameplate, as long as the hourly specific gravity readings of the lowest cell show an increase, and continue charging for three hours after the last increase shown.

Q.—Why is good ventilation of the locomotive battery compartment necessary?

A.—A free flow of outside air over and around the battery helps to dissipate heat and to prevent excessively high operating temperatures, especially if the voltage regulator is not functioning properly or if the locomotive operates in a very warm climate. Based on long experience, the Electric Storage Battery Company can testify that a well ventilated battery compartment promotes long battery life.

A specific gravity check should be one of the first things done after receiving a new battery. Notice that the mechanic in the photograph has his eyes at the same level as the hydrometer in order to get an accurate reading

The screens (which should be ¼ in. mesh) over the ventilating openings, must be kept clean. Outside matter, such as dirt and paint, should not be allowed to clog screens. Therefore, before placing the battery trays in the compartment make sure that all ventilating openings meet these requirements. Lack of ventilation is one cause of high battery temperatures.

S. K. Lessey
The Electric Storage Battery Company

Car Electrical Equipment

Questions and Answers

Q.—What is a generator regulator?

A.—A generator regulator regulates the voltage and limits the current produced by the generator. At low train speeds the generator field current is at a maximum to produce rated voltage and current. As the train speed increases, the regulator decreases the field current to maintain a constant voltage. If at any train speed the current being taken from the generator tends to exceed that for which the regulator is set, the generator field current is automatically reduced to limit the current to normal value.

Q.—What is a reverse current relay?

A.—A reverse current relay automatically connects the generator to the battery and load when the voltage pro-

duced by the generator is slightly above that of the battery and disconnects the generator when its voltage falls slightly below that of the battery. The reverse current relay has a current coil which holds the relay contacts tightly closed when current is being delivered by the generator. When the train slows down to a point where the voltage produced by the generator is below battery voltage, the reverse current flowing from the battery to the generator through the relay causes it to open.

Q.—What is a load regulator?

A.—A load regulator regulates the voltage on the car lamps or other load. To charge the batteries, the generator voltage is maintained at a higher value than the normal battery voltage. The load regulator places a variable resistor in series with the load to hold constant voltage on the load regardless of the magnitude of the load or whether power is being furnished from the generator or from the battery.

Q.—What is a genemotor?

A.—A genemotor is a combination d.c. generator and a three-phase a.c. motor mounted in a single frame. The genemotor is driven from the car axle when the car is on the road. When standing in the yard, the motor may be connected to an a.c. supply to drive the generator. An automatic clutch disconnects the genemotor from the axle drive when the car is standing still.

Q.—What is the purpose of the bias coil used in the generator regulator in combination with a genemotor?

A.—The bias coil limits the current which can be drawn from the generator when a lower kw. output is desired from a genemotor being driven by the a.c. motor. The bias coil is a potential coil wound inside the series coil of the regulator and increases the pull of the current solenoid proportional to the reduction in current output desired. The need for such a device is prompted by the lack, in most places, of a.c. standby facilities of sufficient capacity to drive the full rated load of the generator.

L. B. HADDAD

Freon Filter and Compressor

By G. Kleaver*

An average of two gallons or more of oil is removed from the air-conditioning units on each passenger car that is overhauled at the Southern Pacific's General Shops at Los Angeles by means of the portable filter and compressor unit shown in the illustration. When this quantity of oil is removed from the system, the cooling effect is greatly increased. It also reduces the load on the compressor.

The unit consists of a twin compressor, motor, water pump, oil trap, dehydrator, open tank, and a crane and winch for handling freon tanks, all mounted on a three-wheel truck. The tank on which appears the number 154 is the open tank which contains water. For cooling, freon tanks are placed in this open tank. They are centered in the water by fins, welded to the inside of the open tank.

Between the open tank, and the control panel, is an oil filter tank, 30 in. high and 10¼ in. in diameter, containing 18 baffles which are spaced approximately one inch apart. These baffles extend from the top of the tank downward.

Filtering Process

After a car is pumped down, the tank of dirty freon is placed upside down and connected to the filtering unit. The liquid freon and oil flows into the oil filter tank where the oil settles to the bottom.

The compressor is then used to draw the freon in the form of gas from the top of the oil filter tank through a dehydrator and compress it into a clean freon tank. To facilitate this process, the crane and winch are used to place the clean freon tank into the open water tank with a spray of water circulating around the freon tank. The water is drawn from the open tank and sprayed over the top of the freon tank by a circulating pump driven by the same motor used to drive the compressor. After the freon has been cleaned and transferred, the oil is drained from the oil filter tank through a valve at the bottom of the tank.

The valves make it possible to draw a vacuum or apply pressure to the same pipe line. The lower gauge registers 0 to 600 lb. pressure for testing. The other two gauges serve the dirty and clean freon tanks and each reads 0 to 30 in. vacuum and 0 to 150 lb. pressure

The unit is also used to test Waukesha sub-cooler coils before they are mounted on the cars. The coils are tested with freon at 200 lb. pressure. With a cross-over system of valves, the freon is put in and drawn out of the coil without changing any connections.

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EDITORIALS

Why Is Steam Neglected?

Discussing the future of various types of motive power in England, R. A. Riddles, in his presidential address before the (British) Institution of Locomotive Engineers on November 18 last, said that, if one accepted the eventual replacement of steam on proved economic grounds by some other form of motive power, "19,000 steam locomotives will take a long time to liquidate on any possible financial policy and, while a single one of them remains, it will pay a better return if well designed and maintained than if left unimproved and neglected. I think there is a case for continuing the development of the steam engine along with the diesels and electrics for some time yet."

This statement brings up a question which has been discussed in these columns before; that is, the extent to which the steam locomotive and its maintenance are being neglected in America because the diesel-electric locomotive has become the center of interest. Conditions determining the economics of the situation differ in England and the United States. In England domestic coal is available, but oil is not. In the United States both fuels are available in relative abundance. In England the unit capacity of motive power is moderate as compared with that in America. Here steam locomotive unit capacity has crowded economic limits, while the diesel locomotive is made up of a combination of units of moderate capacity which offer a considerable degree of flexibility in utilization. These are at least some of the factors which have caused dieselization to proceed rapidly since the end of 1944 when there were 317 diesel-electric road locomotives in service. In six years the number has increased to 3,894 (8,046 units) and the proportion of train mileage handled by diesels has reached 53.5 per cent in the case of passenger service and 38.8 per cent in the case of freight service.

This accounts for the difference in the attitude of American railroads toward the continued improvement of the steam locomotive and of the facilities for its servicing and maintenance and that expressed by Mr. Riddles. The demand for capital for additions and improvements to railway plant and facilities has always been ahead of the credit available to the railways. The items in improvement budgets have always had to be carefully selected so that the expenditures of available capital would produce the maximum possible return. The greatest current improvement in motive-power service on American railways is that produced by the extension of diesel locomotive ownership. To undertake major programs of steam locomotive betterment or improvement in repair and servicing facilities would divert capital which might otherwise be spent for the purchase of additional diesel locomotives and the retirement of additional steam locomotives. It would seem, therefore, that only in cases where definite limits are set on the extent of dieselization and these limits have been reached is there likely to be much consideration given to operating improvements and expense reductions which can be attained by money spent for steam-locomotive and shop betterments.

The Neglected Tool

Proper maintenance of diesel-electric locomotives requires facilities, material and skilled men interested in the work. Many fine service and repair shops have been built and more are in process of construction or enlargement. Circumstances indicate that material will be in short supply, but even under rationing, diesel repair parts will enjoy a high priority. Good men, too, are in short supply and it is this factor which most acutely affects diesel maintenance. The situation calls for education and training and the building of interest and pride in work done.

Under present circumstances, it is common in many places for a young man to enter railroad service feeling high enthusiasm over the fact that he is going to work on the big diesels. Then, in all probability, he will encounter the too common atmosphere of a railroad shop. He will discover soldiering in a great variety of forms, he will encounter bickering over divisions of work and probably discover a lack of willingness on the part of older men to pass along information. This dates back to the earlier days of steam power when a mechanic setting valves would hide the tram mark with his thumb to prevent his apprentice from discovering how it was done. The young man will also see older men, inexperienced in diesel work, bid in jobs he would like to have. And he will discover that the scope of his work will be so limited, that he will never be able to get the experience which he must have if he is ever to become one of the supervisory force. Older men, too, are affected by the circumstances and find themselves doing routine work in which there is little interest.

The idea that if each one does as little work as possible there will be work for all is still quite widely accepted. But this coin has another face. As railroad shop efficiency falls off, more work must be allocated to the outside shops and as railroad costs rise, more traffic moves to the highways and into the air.

Few men like to work in drudgery or under adverse conditions, and it appears that one of the most important factors now confronting the users of diesel locomotives is to devise means for improving the morale of maintenance forces and for building up an interest in the work which will redound to the benefit of both employee and employer. Shop facilities and materials are available.

The neglected tool is morale. The answer to the question of how to improve it is not easy. Probably there are many answers and in this issue, the *Railway Mechanical and Electrical Engineer* is asking its readers to contribute their thoughts on the matter. The question appears in the Consulting Department, page 78. Will you give us the benefit of your experience?

NEW BOOKS

THE DIESEL-ELECTRIC LOCOMOTIVE HANDBOOK—*Mechanical Equipment. By George McGowan, technical consultant. Published by Simmons-Boardman Publishing Corporation, New York. 276 pages, illustrated, 5½ in. by 8¼ in. Fabrikoid binding. Price, $4.95.*
This is the first of two books explaining the development, construction and operation of the diesel-electric locomotive. It has been written with the assumption that men who work on and operate these locomotives would like to know why they are built and operated in the manner they are, without having to wade through masses of technical details. Technical and maintenance details that do not contribute to this objective have been eliminated.

This book on mechanical subjects avoids the electrical aspects of the diesel-electric locomotive except where it is necessary to clarify the subject under discussion.

A brief history of the development of the diesel engine is included in relation to its first practical use in a locomotive in this country. The development of the diesel-electric locomotive from the first production types to the present day road locomotives has been shown. A description of the function and basic principles of the diesel engine is followed by a detailed description of the various types in railroad use and an explanation of the two- and four-cycle operation, supercharging, rating and horsepower calculations. Engineering fundamentals necessary for a proper understanding of the operation and ability of these engines is set forth and definitions of the common terms used in describing a diesel engine are made.

A section is devoted to describing a method commonly used to calculate, accurately, the proper tonnage ratings and operating speeds of any road locomotive in either freight or passenger service over any given profile.

A general lubricating and cooling system is described and the importance of this function to the operation of the locomotive is shown. Failures or damage possibly due to improper operation of this system are pointed out and the reasons for these damages and their relationship to the operation of the locomotive as a whole. The specifications of lubricating oil are given with a discussion of their importance to the lubricating qualities necessary.

The fuel system is described and the component parts are taken separately and their duties as a part of the whole are shown. The necessity for filters, the operation of various types of filters and their importance to the engine is brought out. Fuel oils are discussed and an explanation is made of the manner in which cetane numbers and/or diesel index for fuel oils is determined. The damage and indications of improper combustion due to defective fuel system, poor grade fuel oil, dirty system or improper use of the engine whether from wrong handling or insufficient maintenance are given.

The construction and development of the modern piston and the functions of the piston in addition to the transmitting power, the liners and water jackets, and piston rings are described. The importance of cooling and lubrication to the life and operation of the assembly and the engine as a whole is stressed.

Connecting rods, bearings and crankshafts are covered in another chapter. Construction, operation and stresses are discussed and the effects of torsional vibration are explained in relation to the use of dampers, balancing and the operation of the engine outside of the critical ranges to avoid this hazard.

Other chapters cover valves, timing, cylinder heads and governors.

The newest steam generator, for use in the passenger type road locomotives, is shown with illustrations. Operating procedure and trouble shooting is included.

The various types of air compressor drives, compressor operation and component parts are described separately.

A brief outline of the prospects for the new gas turbine as it compares to the diesel engine as a prime mover is taken up in another chapter. The major items of construction, maintenance, operation, fuel consumption and auxiliaries of the gas turbine and the diesel engine are compared.

The balance of the book is devoted to the builders of the larger diesel-electric locomotives. A detailed chapter describes equipment built by the American Locomotive Company, Baldwin-Lima-Hamilton, Fairbanks, Morse and General Motors diesel engines.

The book is liberal in its use of data, diagrams and illustrations of equipment. The text has been developed in such a manner as to enable the reader to follow the operation of the engine in a logical sequence and to clarify the operating instructions given with the equipment. The actual function and its cause and effect on the operation of the engine of each of the component parts has been described in the general sections. Trouble shooting or descriptions of operating faults has been general and applicable to any diesel to avoid any conflict with the specific operating instructions given by the builders with their equipment. No attempt has been made to add to or supplement specific instructions but rather to enable the operating man to analyze the operating faults he may find in service as a means of understanding, to the advantage of the equipment, the difficulties that will arise.

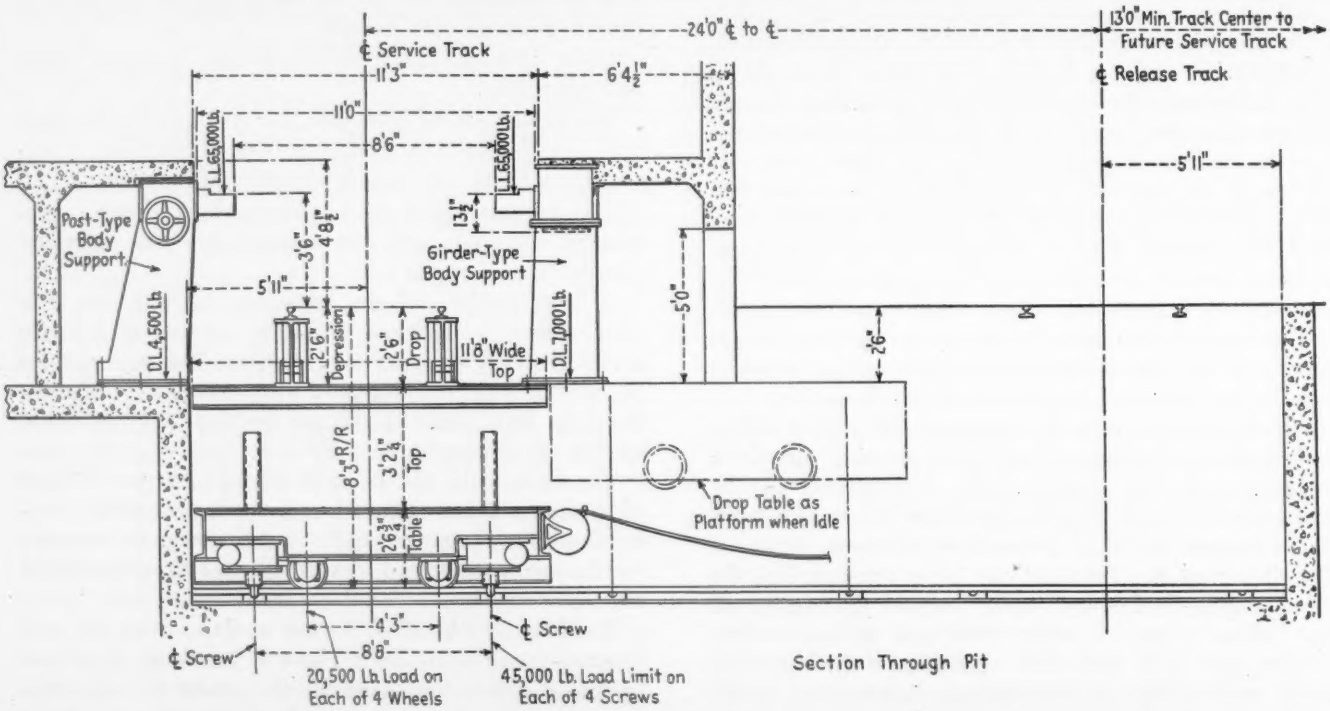
These two books have been prepared as a result of numerous questions by operating and maintenance men seeking information as to what makes wheels go round and why. It has been assumed that the designers of locomotives do not need technical information and that maintenance men have manuals furnished by builders. These books are for the multitude of railroad men in groups other than the above.

NEW DEVICES

Diesel Shop Drop Table

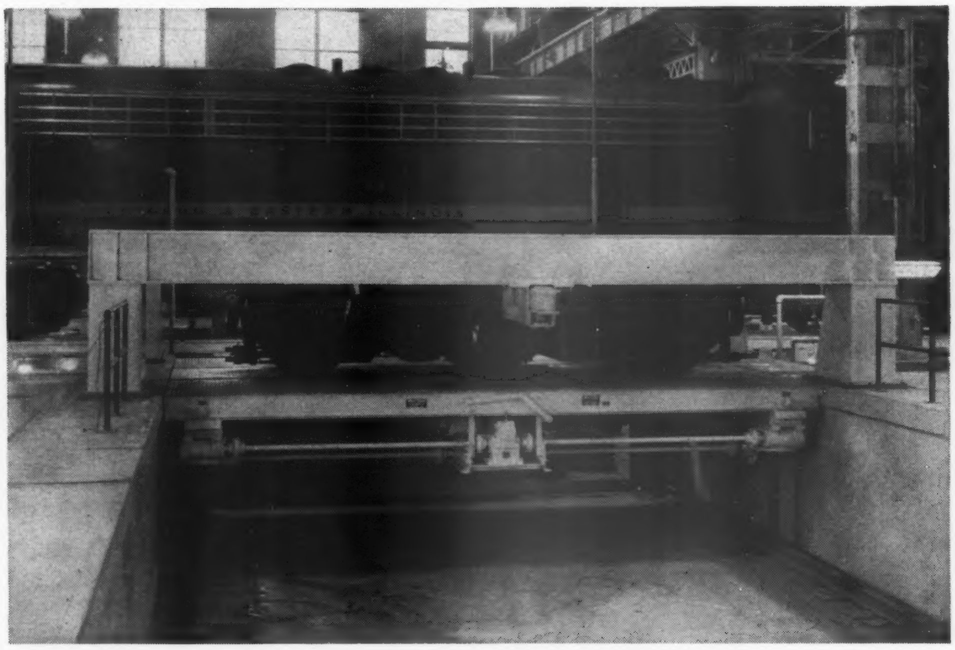
The Illinois Central is now installing a Whiting Consolidated drop table at its new diesel shop at Harahan, La. The normal width of this type of drop table, operating in a shallow, open pit, is 15 ft., to give good working space for men on both sides of the locomotive. Such an installation at the Danville, Ill., diesel shop of the C. & E. I. is shown in one of the illustrations and is usually recommended if the drop table is to go into a shop having floors flush with the tracks.

At Harahan, however, it is desirable to have the drop table in the running repair portion of the shop where the floor is depressed 2 ft. 6 in. below the top of the rail and deck level platforms are installed. An open pit would obstruct passage beside a locomotive along the depressed floor level and consequently the arrangement shown in the drawing was worked out.



Cross-section of pit equipped with Consolidated drop table and detachable top as planned for the Harahan, La. shop of the Illinois Central

The Whiting Consolidated drop table being built for the Illinois Central with nested detachable top in place (left) and table alone in elevated position (right)



Consolidated drop table without detachable top, as installed at C. & E. I. diesel shop, Danville, Ill.

A detachable table top, which spans the drop pit at the depressed floor level and carries rails across the pit at active track level, is supported in its upper position by the usual locking bars in abuttment pockets. The top fits snugly on the Consolidated drop table and is made with four round holes large enough to permit passage of the lifting screws when both the drop table and table top are in the lowered position. The vertical projecting hand lever shown in one of the views is used for operating locking bars at both ends of both rails simultaneously.

The top width of the table is 11 ft. 8 in. which permits installation of a post-type body support at the left end of the pit and a girder-type body support on the other side.

The drop table itself is equipped with four wheels and operates transversely in the shallow pit on rails spaced 21 ft. on centers and positioned 5 ft. 9 in. below the depressed floor level. One pair of these wheels is roller-chain driven from a ¾-hp. electric motor suitably mounted under the table. Four large corner screws extend through the drop table and carry saddles at the lower ends which fit over the rail heads, rest in taper positioning blocks and prevent the screws from turning. Table motion vertically is secured by worm-gear drive from a 30-hp. reversible electric motor located under the center of the table. Electricity is supplied through the rubber-covered cable and spring-operated reel, illustrated. Both table lifting and transfer movements are controlled by means of a pendant push button and extension cord which may be plugged in at selected points outside the pit.

The Consolidated drop table in the I. C. installation is not equipped with rails but is of flat, platform-type construction and, when not in actual use, stands at depressed floor level on the right side of the detachable top. In this position the table spans the pit at the depressed floor level, permits men to work around a locomotive and provides uninterrupted passage of men and material across the pit, beneath the deck-level platform.

When a diesel truck is to be dropped, the locomotive is spotted on the detachable top and the truck is disconnected. The platform-type Consolidated drop table is then dropped down onto the pit rails, traversed to a position under the detachable top, raised and nested beneath the top. After projecting the body-support brackets beneath the locomotive jacking pads, the truck is dropped, traversed to the release track in the heavy repair section on the other side of the partition through the shop, raised to repair track level and released.

Due to the nature of work performed on the repair track, there is no objection to the pit being left open in this portion of the shop. A removable chain or pipe guard may be provided if desired.

Advantages of the drop table installation at Harahan may be summarized as follows: (1) Detachable top and drop table both span the pit at depressed floor level; (2) pit in the running repair section completely enclosed and covered, giving plenty of room for men working around the locomotive and for unrestricted, free passage of material; (3) pit kept to a shallow depth; (4) saving in truck release and re-application time with attendant increase in locomotive availability.

This equipment is manufactured by the Whiting Corporation, Harvey, Ill.

Standard Chilled Wheel

Now that the chilled car wheel known as the AARX-1 has become officially accepted and is in production at all plants, it would seem appropriate to examine it anew. Made standard by the AAR effective September 1, 1950, this wheel first attained limited approval in March, 1947. Between these two dates some 400,000 of these wheels were put into service to develop experience both in the foundry and under cars.

This new wheel was designed to improve the flange and rim strength of chilled wheels. Changes in the tread portion *a*, Fig. 1, consisted mainly of an increased thickness of rim *b*, Fig. 1, an increase in the thickness through the throat of flange section of the tread *c*, Fig. 1, and a change in contour and number of brackets under the flange section *d*, Fig. 1. See also Fig. 2.

As originally conceived by the Wheel Design Committee of the Association of Manufacturers of Chilled Car Wheels, the metal necessary to strengthen the tread section of the wheel was obtained by coring out the central

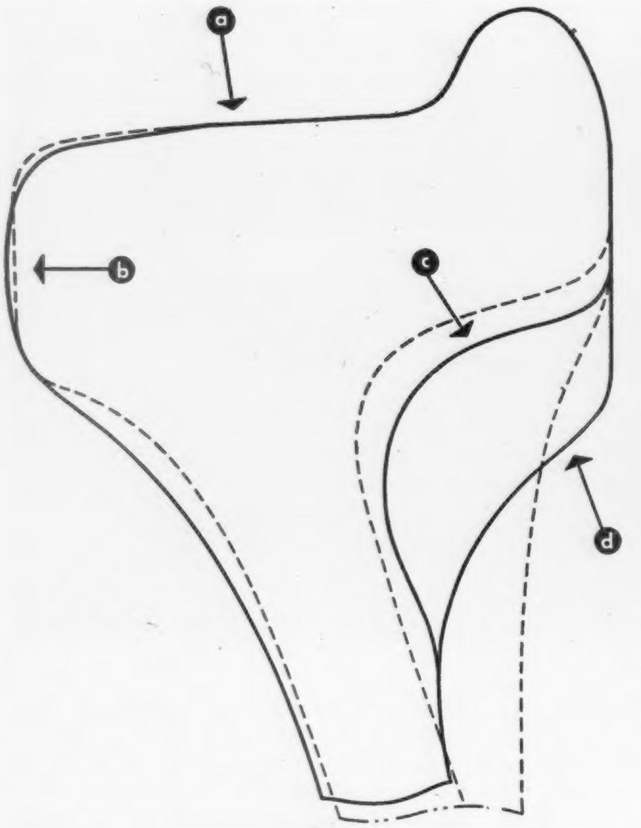


Fig. 1

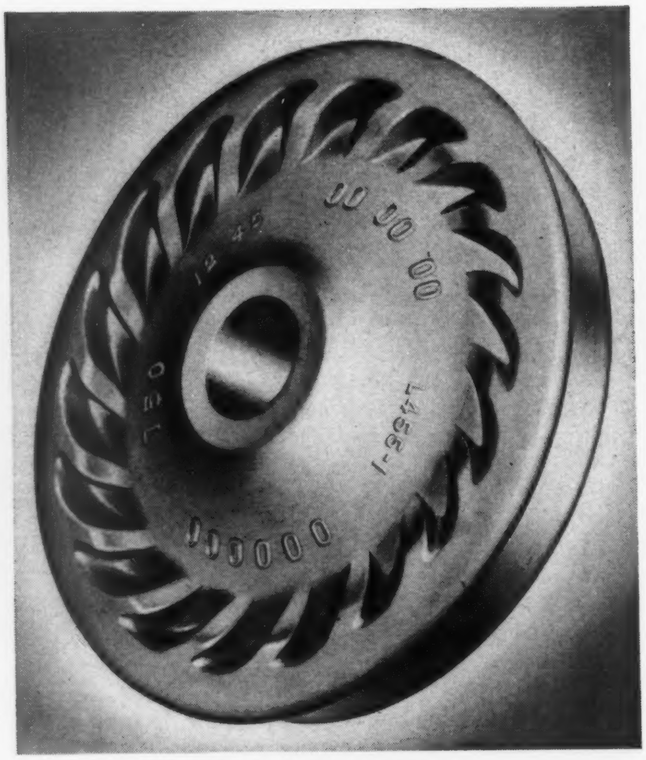


Fig. 2

portion of the hub. Thus, metal was taken from the portion of the wheel where stresses were low and placed where service indicated that stresses were relatively high. Later, the A.A.R. added an approved alternate solid hub design with the same redesigned tread section. Thus, the improvement in the tread area is the outstanding characteristic of the present chilled car wheel.

The thickness of tread through the throat of the flange section has been increased by $\frac{1}{4}$ in. in both the 700 and 750-lb. wheels and by $\frac{5}{16}$ in., to a total of $2\frac{5}{8}$ in. in the 850-lb. wheel. No change was made in the back of flange contour and, as a result, there is no effect whatever on any track clearances.

Laboratory tests on wheels made in this manner as compared to former wheels indicate an average increase in flange strength of approximately twenty per cent. These comparative strengths were obtained by testing different groups of standard and experimental design wheels cast one after the other from the same iron.

The rim thickness of the wheels has been increased but, due to the fact that the contour around the rim has been made more rounded so as to eliminate any semblance of corners, a direct comparison in dimensions is not possible. The rim radius at the tread side was increased from $\frac{5}{8}$ in. to $\frac{3}{4}$ in., while on the underside it was increased from $\frac{5}{8}$ in. to $1\frac{1}{8}$ in. The radius joining the underside of the rim to the plate was also increased and the outer face of the rim made curved instead of straight. The result is a general streamlining of the rim side of the wheel which has been effective in increasing rim strength, and should also reduce the tendency for dirt to be trapped, particularly at the lower corner.

The secondary taper on the tread of the wheel was increased slightly to permit a greater tread wear before a so-called "high rim" developed. This increase amounts to approximately $\frac{1}{16}$ in. at the beginning of the rim radius and, with the increase in this radius, the intensity of impact blows on the rim in service is reduced. In addition, the new design permits a better control of chill depth in this portion of the tread and hence greater resistance to impact blows.

Rim tests made on this design have been conducted in a draft gear testing machine in which a 27,000-lb. weight was dropped one inch onto a striking key which rested on the rim at a distance one inch in from the outer face. The results of these tests show conclusively that the rim of the new wheel stands an average of twice as many blows as the former standard wheel before failure. Later tests in which a 400-lb. weight was dropped five feet to a striking key in the same position produced the same relative results.

The brackets of the new wheel have been made shorter and stockier. They have also been increased in number from 13 to 18, though a maximum of 20 is permissible. The object of this change was to obtain a more uniform support under the flange and also to take care of the possibility that long brackets tend to cause stress concentrations in the wheel plate. The plate itself has been modified to some extent to further improve its resistance to service stresses.

Drop tests made on these wheels have been better than on the previous standard. Numerous thermal tests have been made and, while failures of the previous design were rare, the new wheel shows even greater plate resistance to tread heating.

There has been a very definite improvement in chill control during the past ten years as a result of research on the part of the Wheel Association and its member companies. It was aimed at an increase in the amount of gray iron back of the wear-resistant chill in the wheel tread, while still retaining sufficient chill for maximum tread wear. A combination inoculating treatment added

to the pouring ladle, just prior to its being filled with molten metal, was eventually found to accomplish this purpose and it is now being used at all A.M.C.C.W. wheel foundries as well as some of the others. Although this treatment was used in the previous wheel, it is even more effective in this new design, because tread section is heavier.

It has been definitely proved that wheels having a good backing of gray iron in the tread are stronger, both in the flange and rim, than wheels having a relatively open mottle backing. Specifications on chill applying to these wheels eliminate the possibility of mottle extending through the entire tread section, either at the rim or the flange. This advance in manufacturing methods adds to the improvement in design to give a stronger flange and rim in service.

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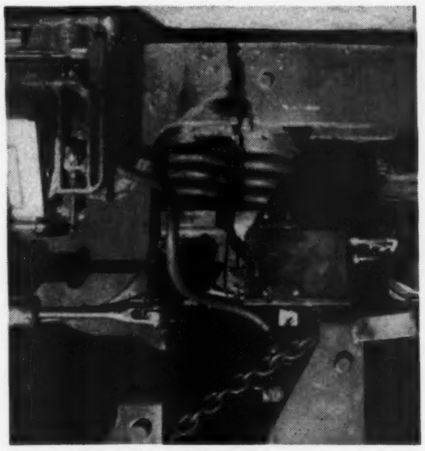

Truck Lubricator

Recently developed and introduced to rail lines is the Type PC railroad truck lubricator made by the Nathan Mfg. Co., New York. This device is designed to permit efficient lubrication of diesel locomotive trucks, particularly of flanges, center plate, spring bearings and other low-pressure points.

The unit consists of a welded steel box which functions as a housing for seven individual pumping units, and as a reservoir for the oil. These pumping units, mounted in a cast iron frame within the housing, are connected to the flanges, spring bearings and center plate by piping, and provide lubrication of these points in proportion to the amount of vertical motion between the truck frame on which the housing is mounted, and the journal box, to which the drive arm of the unit is connected by a flexible strap.

Each series of 20 vertical movements of the journal box in relation to the truck frame, delivers a maximum of 1 cubic centimeter of oil from each of the seven pumping units. This amount may be decreased to zero through separate external adjustment screws for each of the seven units.

This lubricator is of the check-valve type, with a packed piston and spring return stroke. Reservoir capacity is 15½ pints.

Spring Hinge and Adjustable Lock

Designed for all drop-bottom cars of the gondola type with drop doors of any size, the spring hinges make possible one man closure of heaviest doors while the adjustable locks assure uniform door fit by compensating for irregularities in construction and normal warpage during use. The combination maintains individual door operation to suit all lading and unloading conditions.

The hinge relieves the major portion of the door weight from the operator through heavy coil springs operating on variable eccentricity. They are mounted in steel castings to assure free operation.

An eccentric is located in the base of the adjustable latch and allows uniform adjustment between the doors and floor of the car. Difficult operation and loss of lading due to warped doors are avoided.

This hinge and lock combination is made by the Wine Railway Appliance Co., Toledo 9, Ohio.

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Heavy Duty Spiral Milling Attachment

Supplementing the improved attachment for the No. 40 standard milling machine, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio, is introducing a heavy duty device which, like the smaller unit, is driven from the machine spindle.

This attachment is designed for the larger and more powerful Cincinnati millers, from the No. 3 dial type to the No. 6 dual power dial type units.

It has many features of value for miscellaneous milling operations requiring the cutter spindle adjusted to any angle in the vertical or horizontal planes. Accurately spaced graduations facilitate angular settings.

In order to develop the highest degree of rigidity, the power take-off bracket is clamped to the face of the column and also to the overarm. The spindle and all shafts are mounted on anti-friction bearings; the spindle nose conforms to the No. 50 standard.

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Aluminum Alloy Rivets

A new aluminum alloy rivet in the large size range, has been developed by Aluminum Company of America and is offered on an experimental basis for use with heavy duty aluminum structures. The new rivet alloy has been temporarily designated as XB77S. Rivets of this material can be hot driven by hand pneumatic hammers.

In these rivets, Alcoa has provided the following characteristics: an average shear strength of 38,000 p.s.i. within two weeks after driving, a wide temperature range for driving, and good resistance to corrosion when used in recommended applications. The high strength rivet combined with favorable driving characteristics makes possible aluminum applications in bridges and railroad cars. When duplicating those aluminum structures that in the past have been designed using other aluminum alloy rivets, it will be possible now to reduce the bulk and complexity of the joints by using the stronger XB77S rivets.

The rivets are available in the ½, ⅝, ¾, ⅞ and 1 inch sizes. When heated within the required temperature range, it is possible to drive each of the above sizes, except the 1 inch, with the proper hand operated pneumatic hammer. When the rivets are squeeze driven, the size range can be extended to include the 1 inch rivet.

The wide heating range, 850-975 deg. F., is advantageous when dealing with field work and is also of importance when shop fabricating aluminum structures. The driving pressure decreases as the temperature is increased within the above-mentioned heating range. In all cases, the required driving pressure depends directly on the rivet temperature at the instant of driving. As is usually the case with hot driven aluminum rivets, the driving pressure for the smaller size rivets is

much more sensitive to any delay between heating and driving than that for the larger sizes.

During preparation for driving, the rivets should be heated in air (never in lead or nitrate) and soaked within the specified temperature range for fifteen minutes. If the heated rivets should fall short of the recommended minimum driving temperature of 850 deg. F., the difficulty of driving will be materially increased. Driving the rivets at temperatures above the upper limit of 975 deg. F. will most likely result in cracked rivet heads.

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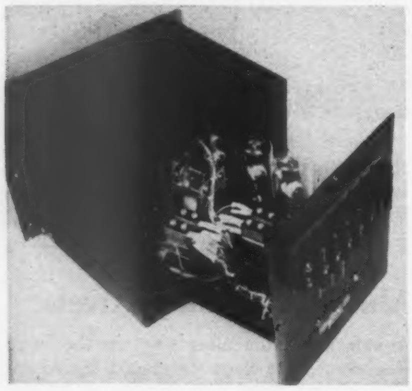

Caboose Power Load Control Switch

A load control switch for use on axle-driven, generator-battery powered radio-equipped cabooses is now being made by the Gore Company, Denver 1, Colo. It will connect the load to the battery when brake air pressure is applied to the caboose and will keep the load on for four minutes after the train is broken up at terminals. The communication equipment can be turned on for 12-minute intervals in the absence of train line air by pressing a handset button.

When the caboose is entrained and the train line air pressure gets up to 20 lb., the air pressure actuates an air switch which turns on the radio load and keeps it on as long as the air pressure is 20 lb. or more. When the load is first turned on, a series of thermal relays are also started in motion, so that the last one of the sequence shunts the air switch contacts. When the train line pressure drops off, due to a break-in-two on the road, or breaking up the train in terminals, the air switch immediately opens; but the radio load remains on until the breakdown of sequence of the series thermal relays is affected. This breakdown takes 4 minutes, which is adequate time for radio use in the case of train break-in-two or other emergency. As soon as the radio load goes *off*, it is possible to reinstate the radio load immediately merely by depressing a push-to-talk handset switch. In this case, the radio load will be placed in the *on* position for 12 minutes; the time required for both the build up and breakdown sequence of the thermal relays. This operation can be repeated as often as necessary or desired.

The switch reduces battery drain when the caboose is in terminals or switch yards and should serve to prevent damage due to freezing of discharged batteries in terminals, allow the use of smaller lower cost batteries, reduce maintenance and replacement of batteries, and prevent radio outage at start of runs because of discharged batteries.

The switches can be obtained for any voltage system. They have no battery drain when turned off, and use 10 and 12 watts when turned on.

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Tester for Transition Relays and Speedometers

New equipment for testing speed-sensitive devices on Alco-G.E. road locomotives has been announced by the General Electric Company. The equipment consists of a portable axle-generator drive unit and a portable tachometer-frequency indicator.

Designed to speed up locomotive maintenance operations and to help insure proper operation of speed-sensitive devices, the test equipment aids in the accurate setting of automatic-transition relays and overspeed relays, and checks the accuracy of speedometers and the sequence of contactors and speed-sensitive relays.

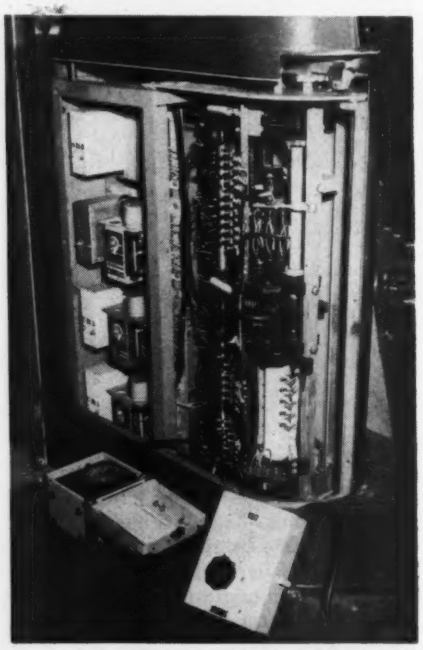
One man can operate the equipment, and the control and meter can be placed next to the equipment being tested.

The portable axle-generator drive drives the locomotive axle generator at controlled speeds, by means of a 75-volt, d.c. motor, a rheostat, a mounting and carrying frame, and leads which connect to the locomotive battery circuit. The mounting frame is designed for attaching the drive unit to generator Models 5GYA3A1 or 5GYA17A1. The drive unit is connected by removing the small end cover from the generator, removing the spline shaft connecting the generator to the axle, and inserting the spline of the drive unit. The unit weighs 60 lb. and is equipped with a carrying handle.

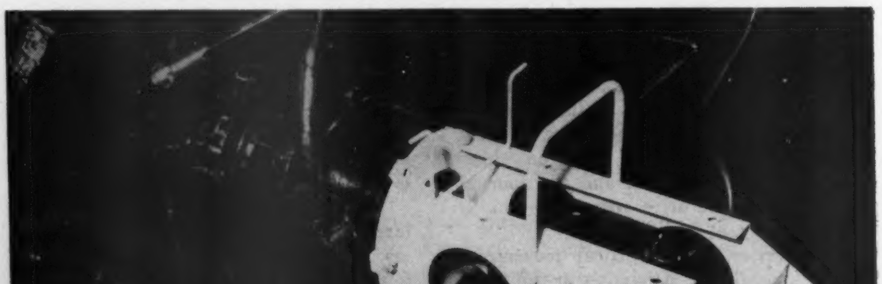
Besides its use with the automatic-transition type axle generator, the drive unit can also be used to drive the small axle-generator (Model 2CM4J7), which operates a speedometer only, when the locomotive is not equipped for automatic transition. In this case, the axle generator is removed from the journal box cover and mounted on the drive unit.

The portable tachometer-frequency indicator is an electric frequency meter which was developed especially for this test equipment. A cycles-per-second scale provides information for accurately setting the automatic-transition relays. The instrument is easily calibrated by means of a switch and calibrating screws, after plugging into a 60-cycle, 115-volt outlet.

A dual-purpose instrument, the tachometer frequency indicator also indicates engine speed by reading the output of the engine tachometers. The unit is adaptable for both old and new locomotives, with or without plug receptacles on the engine control panel.



The portable tachometer-frequency indicator (left foreground) and the portable axle-generator control (right foreground)



The portable axle-generator attached to the locomotive axle

NEWS

Glass Works Establishes Center at Corning

THE Corning Glass Works, Corning, N. Y., at a press conference early in February, announced the establishment of a Glass Center at Corning, N. Y., which will comprise a library and museum collection of the world's glass knowledge where it will be available for research of the industry as a whole. Corning's own facility for research in glass hitherto devoted to the specialized branches of technology embraced by its present laboratory facilities will be considerably augmented by the Glass Center. This project will carry into effect the belief of the company management that industrial research can be broadened effectively to include not only research in scientific aspects of a material, but also in its artistic, historical, philosophical and human relations aspects.

James M. Brown, III, director of the Corning Glass Center, has been director of the William A. Farnsworth Museum in Rockland, Me. The director of the Corning Museum of Glass is Thomas S. Buechner, who came from the Metropolitan Museum of Art.

A.A.R. Mechanical Division Circulars

CONSERVATION OF ZINC IN AB VALVES

To improve the performance of AB brakes during cold weather and thereby eliminate some of the previous difficulties experienced in operating freight trains during winter months, A.A.R. Interchange Rule 60 was modified in the 1951 Code to require the renewal of certain parts of AB valves in all cases where air brakes receive periodic attention and also to provide for the renewal of other parts under certain conditions.

According to a recent A.A.R. Mechanical Division circular, this improvement program will require the air-brake manufacturers to furnish these parts of AB valves in quantities considerably larger than heretofore manufactured for replacement purposes, and this will involve additional consumption of zinc used in their manufacture. Furthermore, there is a likelihood that restrictions will soon be imposed on the consumption of zinc.

Since zinc alloy used in the production of these parts is to a specification which must be maintained, the scrap material derived from old scrap parts is usable to a maximum degree, and the circular urges that these parts be shipped back promptly to the manufacturers for reclamation and reuse of the zinc alloy they contain. The parts of AB valves involved include emergency portion ball check and back covers, service portion back covers, duplex release valve-filling pieces and bodies and quick service limiting valve covers.

DERAILMENTS DUE TO COUPLER KEYS WORKING OUT

A western railroad reports that it experienced three train accidents during 1950, involving main line derailments, as well as several other derailments in train yards, all caused by coupler draft keys working out and allowing couplers to drop between the rails. One of these derailments resulted in the loss of 30 loaded freight cars, as fire broke out because of the accident and could not be controlled.

A.A.R. Interchange Rule 3, Sec. (d) outlines the existing requirements with respect to draft key retainers for cars moving in interchange service, as well as the requirements which are to become effective on January 1, 1952. Sec. (g) of Interchange Rule 18 reads as follows: "When cars are on repair tracks for any purpose, A.A.R. alternate standard, or approved

SELECTED MOTIVE POWER AND PERFORMANCE STATISTICS

Item No.		Month of October 1950	Month of October 1949	10 months ended with October 1950	10 months ended with October 1949
	FREIGHT SERVICE (DATA FROM I.C.C. M-211 AND M-240)				
3	Road locomotive miles (000) (M-211):				
3-05	Total, steam	32,308	28,103	288,811	331,233
3-06	Total, Diesel-electric	19,813	13,923	172,503	123,313
3-07	Total, electric	902	680	8,289	7,977
3-04	Total, locomotive-miles	53,035	42,714	469,660	462,544
4	Car-miles (000,000) (M-211):				
4-03	Loaded, total	1,909	1,459	16,229	14,938
4-04	Empty, total	941	728	8,459	8,465
6	Gross ton-miles-cars, contents and cabooses (000,000) (M-211):				
6-01	Total in coal-burning steam locomotive trains	56,875	37,541	482,043	520,005
6-02	Total in oil-burning steam locomotive trains	15,257	16,139	128,384	149,671
6-03	Total in Diesel-electric locomotive trains	57,016	39,444	489,918	352,928
6-04	Total in electric locomotive trains	2,493	1,719	22,071	21,414
6-06	Total in all trains	131,695	94,868	1,122,678	1,044,130
10	Averages per train-mile (excluding light trains) (M-211):				
10-01	Locomotive-miles (principal and helper)	1.05	1.04	1.05	1.05
10-02	Loaded freight car-miles	40.20	37.80	38.60	36.30
10-03	Empty freight car-miles	19.80	18.90	20.20	20.60
10-04	Total freight car-miles (excluding caboose)	60.00	56.70	158.80	56.90
10-05	Gross ton-miles (excluding locomotive and tender) (000)	2,774	2,460	2,673	2,537
10-06	Net ton-miles (000)	1,307	1,052	1,222	1,140
12	Net ton-miles per loaded car-mile (M-211)	32.50	27.80	31.60	31.40
13	Car-mile ratios (M-211):				
13-03	Per cent loaded of total freight car-miles	67.00	66.70	65.70	63.80
14	Averages per train hour (M-211):				
14-01	Train miles	16.60	17.20	16.90	16.90
14-02	Gross ton-miles (excluding locomotive and tender) (000)	45,330	41,877	44,526	42,362
14	Car-miles per freight car day (M-240):				
14-01	Serviceable	49.90	39.20	45.20	41.80
14-02	All	47.30	36.50	42.30	39.40
15	Average net ton-miles per freight car-day (000) (M-240)	1,029	678	879	790
17	Per cent of home cars of total freight cars on the line (M-240)	35.60	50.50	41.70	55.40
	PASSENGER SERVICE (DATA FROM I.C.C. M-213)				
3	Road motive-power miles (000):				
3-05	Steam	11,792	13,367	117,072	157,585
3-06	Diesel-electric	15,476	13,283	145,712	125,699
3-07	Electric	1,623	1,605	16,033	16,542
3-04	Total	28,891	28,254	278,817	299,939
4	Passenger-train car-miles:				
4-08	Total in all locomotive-propelled trains	278,190	269,690	2,686,423	2,808,524
4-09	Total in coal-burning steam locomotive trains	63,050	69,637	604,754	825,497
4-10	Total in oil-burning steam locomotive trains	36,677	39,386	368.966	440,417
4-11	Total in Diesel-electric locomotive trains	160,950	142,862	1,540,161	1,361,666
12	Total car-miles per train-miles	9.45	9.30	9.44	9.18
	YARD SERVICE (DATA FROM I.C.C. M-215)				
1	Freight yard switching locomotive-hours (000):				
1-01	Steam, coal-burning	1,541	1,226	14,230	17,651
1-02	Steam, oil-burning	298	265	1,478	2,761
1-03	Diesel-electric[1]	2,822	2,001	24,839	19,688
1-06	Total	4,692	3,518	41,820	40,363
2	Passenger yard switching hours (000):				
2-01	Steam, coal-burning	53	73	581	913
2-02	Steam, oil-burning	15	14	134	155
2-03	Diesel-electric[1]	241	217	2,278	2,075
2-06	Total	345	340	3,334	3,494
3	Hours per yard locomotive-day:				
3-01	Steam	9.00	6.40	8.00	8.20
3-02	Diesel-electric	18.10	16.10	17.40	17.20
3-05	Serviceable	15.00	12.60	14.10	13.30
3-06	All locomotives (serviceable, unserviceable and stored)	13.00	9.90	11.90	11.10
4	Yard and train-switching locomotive-miles per 100 loaded freight car-miles	1.71	1.69	1.78	1.87
5	Yard and train-switching locomotive-miles per 100 passenger train car-miles (with locomotives)	0.77	0.78	0.77	0.77

[1] Excludes B and trailing A units.

equivalent, coupler draft key retainers should be applied in place of non-approved retainers, at car owners expense, whether or not defective. Former A.A.R. Standard T-Type retainers must not be removed unless defective, but should have an approved lock applied, at car owners expense, thus converting it to an A.A.R. alternate standard."

In a recent circular, the Mechanical Division points out that Sec. (d) of Rule 3 was modified on January 1, 1949, and Sec. (g) was added to Rule 18 in the 1950 Code for the express purpose of causing cars to be equipped with improved designs of coupler draft key retainers and thereby eliminate most of the accidents due coupler draft keys working out.

The circular urges strict adherence to this rule and close supervision to assure careful checking of the condition of draft keys and retainers of all cars before departure from terminals.

Air and Smoke Association Appoints Griebling

Robert T. Griebling, a fellow of Mellon Institute, has been appointed executive secretary of the Air Pollution and Smoke Prevention Association of America, Inc., Mr. Griebling will be located at the Mellon Institute, Pittsburg, Pa., to where the headquarters of the association will be moved from Chicago.

Union Wants Inspection Of Self-Propelled Cars

The Brotherhood of Locomotive Firemen & Enginemen has filed a petition with the Interstate Commerce Commission asking that present locomotive inspection rules be extended to include multiple unit cars and similar self-propelled vehicles designed to carry freight or passenger traffic.

A similar petition was filed recently with the commission by the Brotherhood of Locomotive Engineers. In each case, the unions urged the commission to amend a 1925 order in which the I.C.C. eliminated these cars from the definition of the term "locomotive."

The B. of L.F.&E. petition said many railroads operate these units in unsafe condition due, in large part, "to the absence of comprehensive and enforceable rules and instructions for inspection and testing." It asked that each carrier be required to file such rules and instructions with the commission, or that the I.C.C. prepare and prescribe appropriate rules.

I.C.C. Revises Diesel Brake Rule

Rule 205 (a) of the Interstate Commerce Commission's Rules and Instructions for Inspection and Testing of Locomotives Other Than Steam has been revised as proposed in the commission's notice of October 4, 1950. The rule relates to air-brake equipment, and the revised version, prescribed by the commission's Division 3, reads as follows:

"The main reservoir system of each unit shall be equipped with at least one safety valve, the capacity of which shall be sufficient to prevent an accumulation of pressure of more than 10 pounds per square inch above the maximum working air pressure fixed by the chief mechanical officer of the carrier operating the locomotive.

"Each unit that has a pneumatically actuated system of power controls shall be equipped with a separate reservoir of air under pressure to be used for operating such controls, other than brake controls, which reservoir shall be provided with means to automatically prevent loss of pressure in event of failure of main reservoir air pressure, shall have storage capacity to permit not less than 3 complete operating cycles of control equipment and shall be so located that it will not be readily susceptible to damage. Each unit built before January 1, 1951, that has a pneumatically actuated control system of power control shall be so equipped the first time said unit receives repairs of a general nature but not later than January 1, 1952."

The change is the addition of the second paragraph. The first paragraph was the previous rule. The matter was handled by the commission in a proceeding docketed as Ex Parte No. 174, the revision having

ORDERS AND INQUIRIES FOR NEW EQUIPMENT PLACED SINCE THE CLOSING OF THE FEBRUARY ISSUE

DIESEL-ELECTRIC LOCOMOTIVE ORDERS

Road	*No. of units*	*Horse-power*	*Service*	*Builder*
Akron, Canton & Youngstown	3	1,600	Road-switch	Fairbanks-Morse
Chicago & North Western	30	1,500	Road-switch	Electro-Motive
	4	2,250	Passenger	Electro-Motive
	4	1,600	Freight	Alco-G. E.
	5	1,600	Road-switch	Alco-G. E.
	7	1,000	Yard-switch	Alco-G. E.
	6	660	Yard-switch	Alco-G. E.
	2	1,600	Road-switch	Baldwin-Lima-Hamilton
	4	1,200	Yard-switch	Baldwin-Lima-Hamilton
Chicago, St. Paul, Minneapolis & Omaha	6	1,500	Road-switch	Electro-Motive
	4	800	Yard-switch	Electro-Motive
Nashville, Chattanooga & St. Louis	6[1]	1,500	Road	Electro-Motive
	10[1]	1,500	Road-switch	Electro-Motive
	5[1]	1,200	Switch	Electro-Motive
New Orleans Public Belt	2[2]	800	Switch	Baldwin-Lima-Hamilton
New York, New Haven & Hartford	10[3]	2,400	Road-switch	Fairbanks, Morse
Northern Pacific	24[4]	1,500	Passenger	Electro-Motive
	3[4]	1,500	Road-switch	Electro-Motive
Reading	15[5]	1,600	Road-switch	Baldwin-Lima-Hamilton
	15[5]	1,600	Road-switch	Alco-G. E.

STEAM LOCOMOTIVE ORDERS

Road	*No. of locos.*	*Type*	*Builder*
Norfolk & Western	6	2-8-8-2 freight	Company shops

FREIGHT-CAR ORDERS

Road	*No. of cars*	*Type of car*	*Builder*
Bangor & Aroostook	500[6]	40-ton refrigerator	Company shops
Buffalo Creek	500[7]	50-ton box	American Car & Fdry.
	500[7]	50-ton box	Pullman-Standard
Canadian National	40	30-ton box	Eastern Car
Chesapeake & Ohio	2,500	70-ton hopper	American Car & Fdry.
	1,000	50-ton box	Pullman-Standard
	750	55-ton box	General American
	200	70-ton covered hopper	Pullman-Standard
	200	70-ton gondola	General American
	250	70-ton flat	Greenville Steel Car
Chicago & Eastern Illinois	300	70-ton hopper	Pressed Steel
	700	50-ton hopper	Pressed Steel
	200	50-ton box	American Car & Fdry.
	300	50-ton box	Company shops
Ford Motor Co.	120	70-ton gondola	Greenville Steel Car
	119	70-ton gondola	Magor Car
Lehigh Valley	350[8]	70-ton gondola	Bethlehem Steel
Louisville & Nashville	3,000	50-ton hopper	Pullman-Standard
	2,200	50-ton box	Pullman-Standard
	300	50-ton box	Pressed Steel Car
	450	Pulpwood	Company shops
Norfolk & Western	3,000[9]	70-ton hopper	Company shops
	500[9]	50-ton box	Pullman-Standard
Norfolk Southern	150	50-ton gondola	Magor Car
Reading	1,000[10]	50-ton hopper	Bethlehem Steel
	1,000[10]	70-ton gondola	Bethlehem Steel
Southern Pacific	1,500	50-ton box	Company shops
Union Pacific	500	40-ton stock	Company shops
	500	70-covered hopper	Company shops

FREIGHT-CAR INQUIRIES

Delaware, Lackawanna & Western	500-1,000	Hopper
Virginia	300	Box

[1] Delivery of the switchers was expected by February 15 and the delivery of the other units by March 15. Acquisition of these units will complete dieselization of the road.
[2] Acquisition of these units will complete the road's dieselization.
[3] To cost approximately $2,225,000. Delivery to be completed this year.
[4] Delivery of road switchers scheduled for March and of the freight locomotives for May and June.
[5] To cost about $4,000,000.
[6] Authorization to acquire these cars at a cost of $500,000 was reported in the February issue.
[7] For delivery in the first quarter of 1952.
[8] To cost approximately $2,300,000. Delivery expected to be completed early in 1952.
[9] Delivery of the hopper cars expected to begin in the last quarter of 1951. Delivery of the box cars expected to begin next December.
[10] Gondolas to cost $6,170,000; hoppers, $4,875,000.

NOTES:
Erie.—The board of directors of the Erie has authorized the purchase of 500 box and 500 mill-type gondola cars.

been recommended by Edward H. Davidson, director of the Bureau of Locomotive Inspection Division 3's order prescribing the new rule was dated January 29. It noted that no objection to the change was filed pursuant to the notice of October 4, 1950. (See page 701 November 1950, *Railway Mechanical and Electrical Engineer.*

Miscellaneous Publications

VAPOR STEAM GENERATOR.—Vapor Heating Corporation, Railway Exchange building, Chicago. Bulletin 1213. 38 pages, 8½ in. by 11 in., illustrated. Covers performance of Vapor steam generators in diesel locomotive service with particular reference to severe cold weather operation. Includes papers on new features of engineering design, periodic maintenance, water treatment, and a stenographic report of an all-day conference, sponsored by Vapor, held at Chicago on September 21, 1950, and attended by diesel representatives from 45 railroads.

POWER TO STOP.—American Steel Foundries, 400 North Michigan Avenue, Chicago 11. 16-page bulletin. Summarizes a 16 mm. color sound moving picture of the same title recently released for showing to railroad clubs and car foremen's associations. Film illustrates the energy involved in stopping passenger trains from high speeds and shows the effectiveness with which Simplex unit-cylinder clasp brakes operate under all conditions. Laboratory test equipment and road-test car are also featured in the bulletin as well as in the film, and test results summarized.

SUPPLY TRADE NOTES

TENNESSEE COAL, IRON & RAILROAD CO. —*Robert Gregg* has retired as president of the Tennessee Coal, Iron & Railroad Co., a subsidiary of the United States Steel Corporation, and has been succeeded by *Arthur V. Wiebel*, formerly vice-president in charge of operations.

◆

LUMINATOR, INC.—*E. Z. Zimmerman* has been appointed associate design engineer of Luminator, Inc.

◆

AIR REDUCTION COMPANY.—The Air Reduction Sales Company, a division of the Air Reduction Company, 60 East 42nd street, New York 17, has recently completed a 16 mm. two reel sound motion picture which tells the story of the new Aircomatic process for welding aluminum, stainless steel, bronzes and Monel. The film explains the nature, character and uses of the process, with close-up photography of the Aircomatic arc. It is designed

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Totally enclosed, dustproof motor . . . cover easily removable for internal inspection.

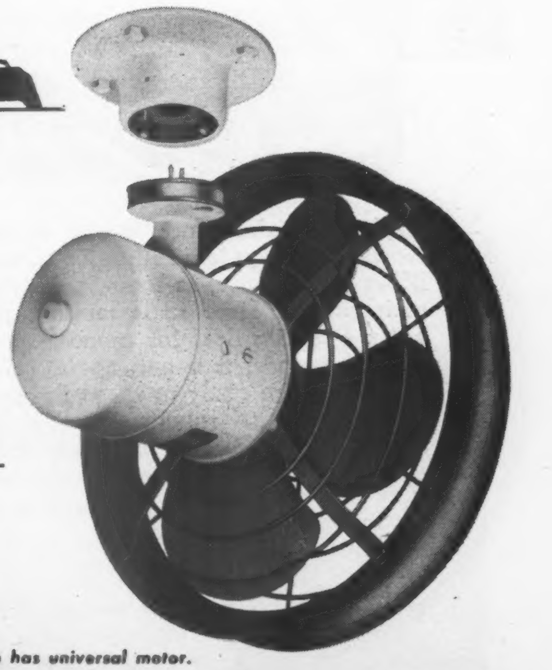
Aerodynamically correct venturi ring assures maximum air delivery.

Base-located plug and receptacle allow instant motor removal from line without breaking connections.

Swivel mounting arrangement permits adjustment of fan for any desired air direction.

4-blade, 12-inch diameter fan unit now available to the following specifications:

Catalog No.	Volts	Amps.	Air Delivery CFM	Fan Speed RPM
91290	32 DC	.93	2550	1780
91390	64 DC	.47	2550	1780
*90749	110 DC	.42	2550	1780
	110 AC-25 Cycle	.515	1740	1225



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for presentation before non-technical as well as technical groups, who may make arrangements for its showing by communicating with Air Reduction. The film, entitled "The Tool for the Job," has a running time of 21 min.

◆

MacLean-Fogg Lock Nut Company.—As reported in the February issue, 1950, *Railway Age*, *Ernest G. Doke* and *Joseph J. Murphy* have been appointed vice-presidents of the Mac Lean-Fogg Lock Nut Company. Mr. Doke, a graduate of Purdue University in 1937, was employed by the Chicago Hutchins Corporation and the U. S. Gypsum Company prior to his association with MacLean-Fogg. He joined that company in February, 1940, as an engineer, and in April, 1943, became assistant to the president.

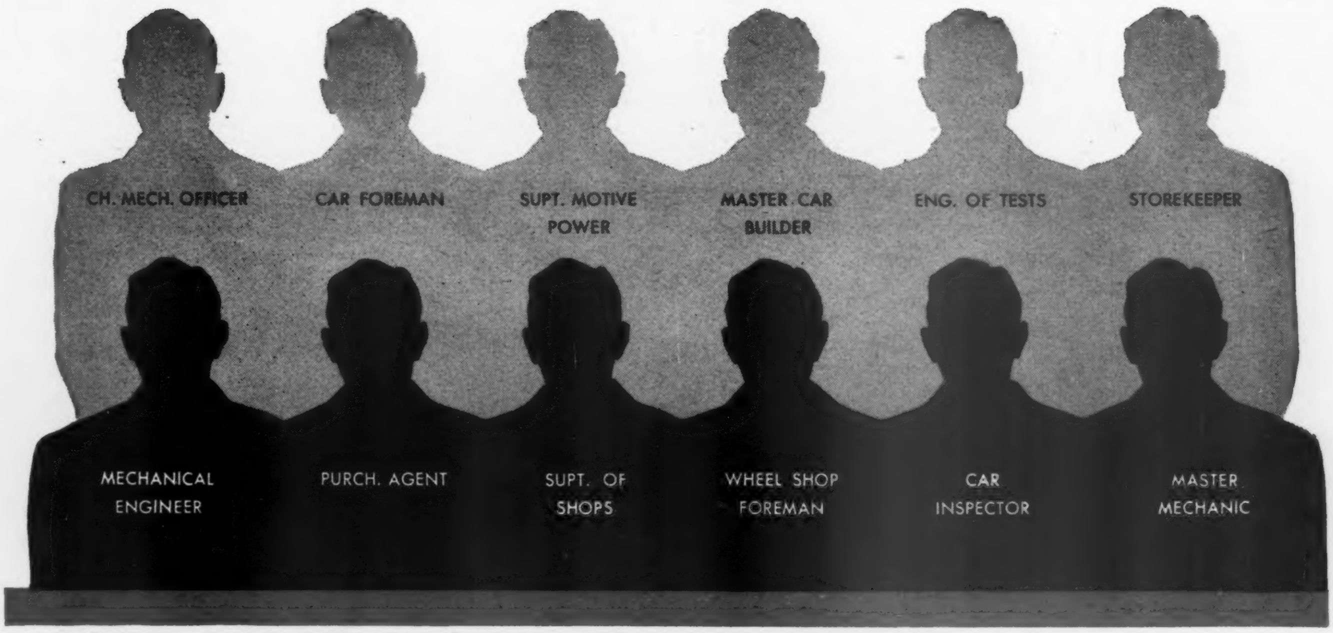
Ernest G. Doke

Mr. Murphy was born in Chicago and is a graduate of Dartmouth (1925). Previous to joining MacLean-Fogg he as in the investment business and with the J. W. Mortell Company. In 1943 he became associated with MacLean-Fogg as a salesman. He was appointed sales manager in 1947.

Joseph J. Murphy

◆

Kennametal Inc.—*John C. Redmond*, formerly research director, has been elected vice-president in charge of metallurgical development of Kennametal Inc., Latrobe, Pa. *Bennett Burgoon, Jr.*, has been appointed assistant to the general sales manager. *Gilbert Bunn*, manager of the Philadelphia-New York district, succeeds



gentlemen of the jury ...do you have all the evidence?

Before you reach firm conclusions regarding the values of chilled car wheels, *be sure you know all the facts*.

Call the witnesses . . .

SAFETY ENGINEER: "The safety record of the AMCCW wheel, considering all factors, is now unsurpassed in freight car service. The latest AMCCW design continues the trend toward even greater trouble-free mileage."

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METALLURGIST: "The AMCCW chilled car wheel requires no work-hardening in service. Consequently there is no flow of tread metal. And the damping property of gray iron in the plate and hub of this wheel reduces axle shock."

MACHINIST: "You can bore AMCCW chilled car wheels faster, with less wear on cutting tools. And the elasticity of iron permits a tighter fit to the axle."

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- Low first cost
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Pullman-Standard Car Mfg. Co.

Mr. Burgoon as manager of the Detroit-Cleveland district. *Douglas C. Cunningham,* formerly representative in the Detroit district, has been appointed manager in the Philadelphia-New York district.

◆

WESTINGHOUSE AIR BRAKE COMPANY.—*Edward A. Boshell* has been elected chairman and president of the Westinghouse Air Brake Company and its subsidiary, the Union Switch & Signal Co., to succeed *A. N. Williams,* president of both companies since 1946. Mr. Williams has been elected vice-chairman of the two organizations.

Mr. Boshell was born in Melvin, Ill. He is a graduate of Culver Military Academy (1919) and of the University of Illinois School of Commerce (1923). He received an LL.B. from the latter institution's College of Law in 1926. In the same year he was admitted to the bar in Illinois and became associated with the law firm of Knapp & Campbell in Chicago. In 1928 he became assistant general attorney for the Consolidated Electric & Gas Co. of Chicago and New York. In 1933 he joined the Stone & Webster Service Corp. as attorney. He became vice-president in charge of finance of Stone & Webster in 1938 and held that office until becoming associated with Standard Gas & Electric Co., New York, ten years later. He has been chairman and president of Standard Gas & Electric and the affiliated Philadelphia Company, Pittsburgh, Pa., since 1948, and will continue in a consultative and advisory capacity to the utility organization. Mr. Boshell has been associated also with the Duquesne Light Company for the past three years.

E. A. Boshell

◆

AMERICAN LOCOMOTIVE COMPANY.—The American Locomotive Company has established a new organization at its Schenectady, N. Y., plant to handle ordnance production while continuing intact its organization for manufacturing diesel-electric locomotives. Railroad customers have been assured, in a policy letter from Duncan W. Fraser, Alco chairman and president, that Alco-General Electric locomotives and parts will continue to be produced at capacity levels and that commitments on deliveries would be met just as in the past, unless national conditions affecting all builders interfere. *A. M.*

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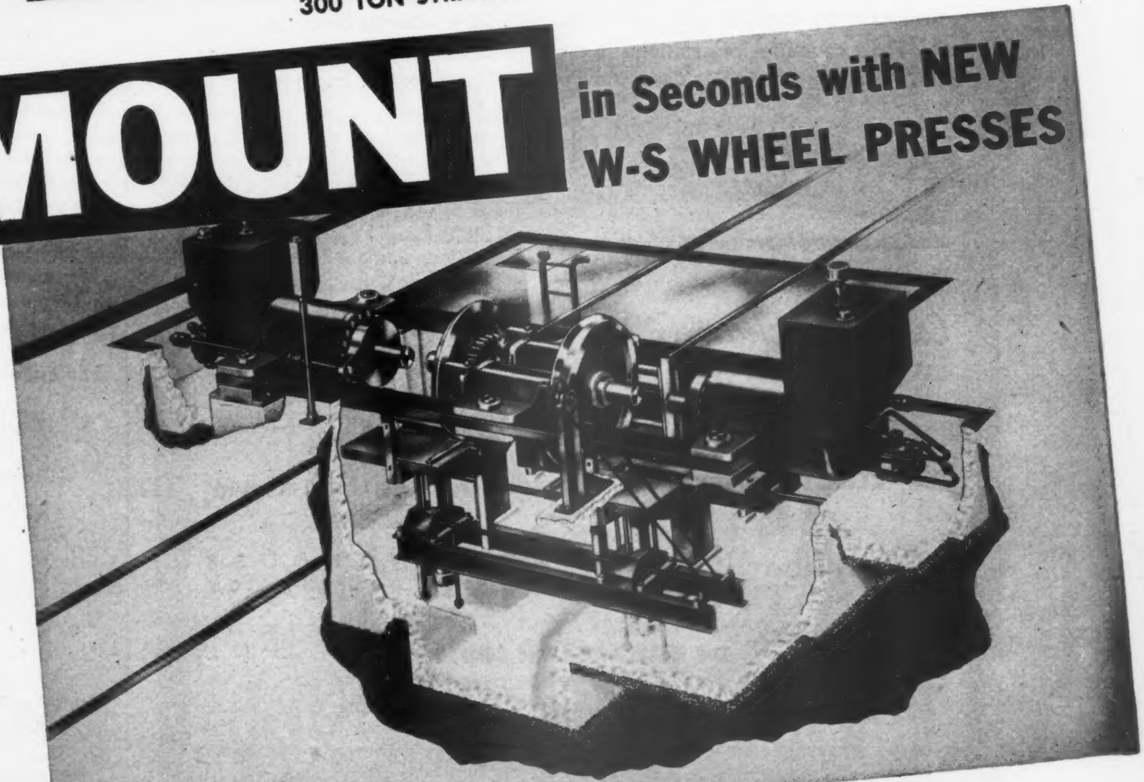

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Denver 2, Colo. .... Overgard Machine Tool Co.
New York 17, N. Y. .... Eastern Railway Supplies, Inc.
St. Paul 4, Minn. .... Anderson Machine Tool Co.
San Francisco 5, Calif. .... Overland Supply Co.
Washington 5, D. C. .... Ralph Payne

9.K.12

Hamilton, vice-president, is in charge of the new Ordnance division, and *W. E. Corrigan*, another vice-president, has been appointed contracting officer of the division.

◆

VAPOR HEATING CORPORATION.—*Stephen Sarnecke* has been transferred from the Chicago headquarters of the Vapor Heating Corporation to Atlanta, Ga., to work with railroads in Georgia, Tennessee, Alabama and the Carolinas. Mr. Sarnecke has been with Vapor for several years in development engineering and has worked with railroads all over the country on train-heating problems.

Stephen Sarnecke

◆

STANDARD RAILWAY EQUIPMENT MANUFACTURING COMPANY.—As reported in the February issue, *J. E. Vaughn* has been appointed vice-president in charge of all sales of the Standard Railway Equipment Manufacturing Company and its subsidiaries, with direct supervision over all the sades offices.

Mr. Vaughn was born at St. Louis, Mo., and attended St. Louis University. He has been associated with Standard and a predecessor for 27 years, having joined the P. H. Murphy Company at New Kensington, Pa., in 1923. He was serving as chief shop inspector at New Kensington in 1929 when he was transferred to Chicago to become sales service engineer. In 1937 he was appointed assistant to the vice-president of Standard Railway Equipment at

J. E. Vaughn

New York. He returned to Chicago in 1938, and in 1943 became assistant vice-president of the company. He was appointed a vice-president of Standard in 1945, and vice-president of the parent company, Standard Railway Equipment Manufacturing Company, in 1947.

◆

National Malleable & Steel Castings Co.—*Herbert L. Mausk* has been elected vice-president, sales, railway division of the National Malleable & Steel Castings Co., and *Ellsworth H. Sherwood* has been elected assistant vice-president, sales, railway division.

Mr. Mausk began his career with National in 1908 as office boy. He advanced

Herbert L. Mausk

steadily through engineering and railway sales positions until his appointment as general manager of sales, railway division, which position he has held for the last five years.

Mr. Sherwood joined the Cleveland (Ohio) works of National in 1920. He

Ellsworth H. Sherwood

worked in various sales capacities until his appointment as manager of sales, railway division, at New York, in which position he was serving at the time he was elected assistant vice-president, sales.

◆

American Locomotive Company.—*Joseph W. S. Davis* has been appointed assistant to W. A. Callison, vice-president, eastern regional sales, of the American Locomotive Company, with headquarters at the company's New York office. Mr. Davis has been assigned responsibility


Tops

for sales of the Railway Steel-Spring Division in the entire eastern seaboard area.

Mr. Davis has been associated with the Railway Steel-Spring Division of American Locomotive since 1930, and since 1945 has been assistant district sales manager in the New York district, which recently was incorporated into the eastern regional sales organization.

◆

Union Asbestos & Rubber Co.—*John S. Lundvall* has been elected vice-president in charge of the Equipment Specialties division of the Union Asbestos & Rubber Co.

Mr. Lundvall was born at Davenport, Iowa, and is a graduate of that city's high school (1922). For several years he was employed as a draftsman at the Davenport

John S. Lundvall

Locomotive Works, subsequently moving to Chicago. He attended night classes at Lewis Institute and was associated with Harry Vissering and the Okadee Co. prior to joining the Equipment Specialties Company, which Union Asbestos & Rubber acquired in 1936 and established as a division. Mr. Lundvall has been in charge of the division since 1945.

◆

K-G Equipment Company.—*Chester F. Delbridge* has been appointed general sales manager of the K-G Equipment Company, formerly the K-G Welding &

Chester F. Delbridge

Cutting Co. He will maintain headquarters at 50 Broadway, New York 4, the executive sales office of the company. Mr.

How "Roller Freight" will cut your operating costs...: *all along the line!*

AT TERMINALS

90% fewer man hours are needed for terminal inspection when freight trains are mounted on Timken® tapered roller bearings!

IN THE YARDS

"Roller Freight" makes more cars available because cars get where they're going faster and spend less time in repair shops. Humping operations cannot displace Timken journal bearing parts.

IN THE SHOP

Timken bearings cut repair bills by reducing wear on draft gear and other parts. Impact damage from "serial starting" jolts can be eliminated.

AT DESTINATIONS

"Roller Freight" reduces lading damage claims by making smoother starts and stops possible. Timken bearings cut starting resistance 88%.

ON THE ROAD

Timken bearings practically eliminate "hot boxes" and the resulting expense and delays. Roller bearing design minimizes friction, permits better retention of lubricants. And there's no waste to "grab."

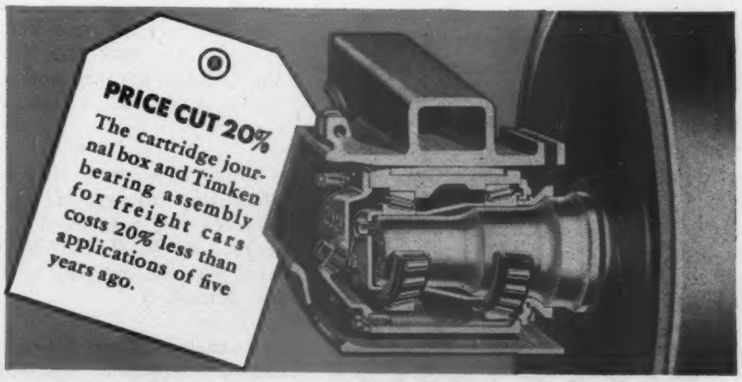
ANYWHERE

Timken bearings reduce starting friction to a minimum. You can schedule full-length trains even in cold weather.

"Roller Freight" will go far in cutting your operating costs. And it will give you a big advantage with shippers when you're bidding for a greater share of tomorrow's freight tonnage. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

TIMKEN *TAPERED ROLLER BEARINGS*

TRADE-MARK REG. U. S. PAT. OFF.



NOT JUST A BALL NOT JUST A ROLLER THE TIMKEN TAPERED ROLLER BEARING TAKES RADIAL AND THRUST LOADS OR ANY COMBINATION

Delbridge was associated with the Air Reduction Sales Company for 20 years, and joined K-G, a unit of Air Products, Inc., six months ago.

◆

ACME COMPANY.—*Boetius H. Sullivan, Jr.*, vice-president and general manager of the Orme Company, has been elected president of the firm.

◆

DETREX CORPORATION.—*W. I. Tebo* has been appointed engineering consultant and technical adviser for the Detrex Corporation at Washington, D. C. His headquarters will be at the Shoreham Hotel.

◆

VANADIUM CORPORATION OF AMERICA.—*Roy F. Hancock* has been appointed assistant to vice-president in charge of sales for the Vanadium Corporation of America,

R. F. Hancock

with headquarters at 420 Lexington Avenue, New York. Mr. Hancock formerly was associated with the Carnegie-Illinois Steel Corporation, Pittsburgh, Pa., as manager of eastern alloy steel sales.

◆

BULLARD COMPANY—*H. Edward Neale* has been appointed assistant sales manager of the Bullard Company at Bridgeport, Conn. *James L. Shay* succeeds Mr. Neale as representative in the Chicago area and will be located at the offices of Marshall & Huschart Machinery Co., 571 Washington boulevard, Chicago.

Mr. Neale became associated with the Bullard Company in 1935 as a student engineer and served in various departments throughout the plant until 1947 when he was selected company representative for the New York State territory. In late 1949 Mr. Neale was given the Chicago territory working out of the offices of Marshall & Huschart Machinery Co.

◆

SIMPLEX WIRE & CABLE CO.—*J. N. Macalister*, manager of the Chicago district office of Simplex Wire & Cable, has retired. *W. H. Davis*, who became associated with the company in 1927, succeeds Mr. Macalister.

◆

FAIRBANKS, MORSE & CO.—*S. W. Hickey* has been appointed assistant manager of the Railroad Products department of Fairbanks, Morse, with headquarters at 600 South Michigan avenue, Chicago. *Orren*

S. Leslie has been appointed manager of the company's plant at Beloit, Wis., suc-

O. S. Leslie

ceeding Henry M. Haase, who has resigned.

Mr. Hickey had previously been with the Simmons-Boardman Publishing Corporation, publishers of the Railway Mechanical and Electrical Engineer, with which company he became associated in

S. W. Hickey

1931. He served in the circulation department, as sales representative in the advertising department, and as western manager of sales until February, 1946, when he became also a vice-president of the corporation.

◆

YALE & TOWNE MANUFACTURING CO.—*Edward J. Heimer*, formerly a vice-president of Clapp & Poliak, Inc., has been appointed sales manager of hand lift and motorized hand trucks made by the Philadelphia, Pa., division of Yale & Towne Manufacturing Co. Mr. Heimer will succeed W. Glen Tipton, retired.

◆

WESTINGHOUSE ELECTRIC CORPORATION.—*S. C. Palmer* has been appointed assistant manager of the transportation department of the Westinghouse Electric Corporation, East Pittsburgh Works.

Mr. Palmer is a graduate of Tufts College (1931) with a Bachelor's degree in mechanical engineering. He joined Westinghouse that same year as a member of the graduate student course and in July, 1934, was assigned to sales duties in the Boston office. In March, 1936, he was named

Jones & Lamson offers the best investment in turret lathes. They are backed by the "know how" of a firm, long predominant in the field, whose many pioneered and perfected developments have brought about far-reaching advances in the art of cutting metal.

Every feature of these lathes has been developed through long-range research and practical experience in production turning. Their superior performance stands out over any other machine of comparable size, because they are built to hold their accuracy at the highest speeds and feeds possible with modern cutting tools — with ample reserves to anticipate new cutting techniques. Jones & Lamson Turret Lathes have a well-earned reputation for ease of operation, low operating costs and year-round dependability. They are recognized for their advantages in SPEED, POWER, RIGIDITY AND REPETITIVE ACCURACY.

They will pay for themselves quickly through savings in direct costs alone!

- **Single lever speed selector —** 12 spindle speeds 30 to 1500 RPM or 20 to 1000 RPM
- **15 HP constant speed motor —** ample horsepower available at all speeds
- **Single lever carriage feed selector —** 9 reversible longitudinal and 9 cross feeds
- **Single lever hexagon turret feed selector —** 9 longitudinal turret feeds
- **All longitudinal and cross feeds automatically** disengaged against positive stops
- **Heavy-duty spindle mounting with rugged** preloaded anti-friction bearings
- **Heat-treated, precision-finished, long-wearing** alloy steel gears
- **Multiple-disc type forward and reverse clutches —** automatic spindle brake
- **Husky, multiple-spline transmission shafts** with anti-friction bearings
- **Hardened and precision ground steel ways —** 12½" in overall width
- **Bridge-type carriage for multiple tooling** at rear of cross slide
- **4-position, quick-indexing square turret —** all faces tapped for extra tool blocks
- **Hexagon turret clamped automatically** on forward stroke of ram
- **Automatic lubrication system with forced** feed to all sliding bearings
- **Complete coolant system —** automatic internal delivery to each hexagon turret face
- **Adjustable graduated handwheel dials and clips** and chrome plated handwheels, dials and levers

Write to Dept. 710 for Complete Information

Turret Lathe Division

JONES & LAMSON

MACHINE COMPANY
Springfield, Vermont, U.S.A.

MACHINE TOOL CRAFTSMEN SINCE 1835

manager of the marine and transportation division in the New England District.

◆

ALUMINUM COMPANY OF AMERICA.—The Aluminum Company of America is building a new alumina plant near Buxite, Ark., which will be operated by its subsidiary the Aluminum Ore Company. The new plant is expected to increase by nearly 50 per cent the amount of alumina now being produced by the company.

◆

HEYWOOD-WAKEFIELD COMPANY.—*Severin B. Hendrickson* has been appointed to the newly created position of manager of transportation seating in addition to his other duties at division headquarters; *E. Harry Reid* has been appointed assistant manager of the division; and *George E. Cornwall* has resigned as sales manager of the division, but will continue as New England sales representative for transportation seating. *Guy M. Ralph* has joined the sales staff of Heywood-Wakefield at New York.

◆

LORD MANUFACTURING COMPANY.—*Robert T. Daily* has been promoted to field engineer in charge of the Chicago office of the Lord Manufacturing Company. He will report to Charles L. Freel, manager of the field engineering department at the home office, Erie, Pa.

◆

JOHN A. ROEBLING'S SONS COMPANY.—*Howard E. Maloney* has been appointed manager of sales; *Frank T. Craven*, assistant manager of sales, and *Roy H. Hainsworth*, eastern regional manager, of the Electrical Wire Division of John A. Roebling's Sons Company, Trenton, N. J. Mr. Maloney was previously assistant manager.

◆

H. K. PORTER COMPANY.—The H. K. Porter Company has acquired the *Delta Star Electric Company*, manufacturer of high voltage electrical equipment.

◆

DEARBORN CHEMICAL COMPANY.—*D. B. Bishop*, sales representative for the Dearborn Chemical Company in the Pittsburgh, Pa., area, has been appointed manager of the company's office in that city, succeeding *J. A. Crenner*, who has retired.

Obituary

JOHN G. LITTLE who retired in 1948 as Assistant to Vice President of the Simmons-Boardman Publishing Corporation died recently.

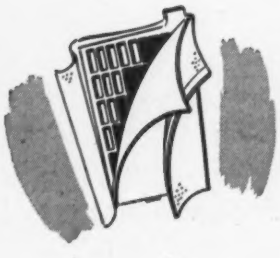
E. J. HILJES, general sales manager of the William Sellers Division, Consolidated Machine Tool Corporation, 1601 Chestnut street, Philadelphia, Pa., died February 3 in Delaware County Hospital. He was 66.

Mr. Hiljes attended Johns Hopkins University and Lehigh University. He had been with the William Sellers Company, Philadelphia, for more than 40 years and was appointed general sales manager when that company merged its machine tool interests with Consolidated Machine Tool

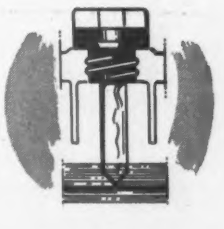
Meet Your Schedules with GOULD-EQUIPPED DIESELS!

Gould Batteries with new "Z" Plates have the extra reserve capacity that you need to keep your engines available. 96% of the working surface of these plates is *regenerative* power-producing material. Grids are 66% more resistant. Porosity of grid metal is reduced 85%.

GOULD BATTERIES with NEW "Z" PLATES
are America's Finest Diesel Starting Batteries



Only Gould has the "Z" Plate that enables Gould Batteries to operate at full capacity more months—stay new longer.



Gould Batteries with Televel Vents save time and trouble—show electrolyte level without removal of vent caps.

Gould's periodic inspection service and technical assistance help keep engines available—enable diesels to meet schedules.

GOULD
STORAGE BATTERIES

GOULD-NATIONAL BATTERIES, INC.*
TRENTON 7, NEW JERSEY

Always Use Gould-National Automobile and Truck Batteries
*Formerly Gould Storage Battery Corporation

Corporation, Rochester, N. Y., in 1947. During World War II Mr. Hiljes was a civilian adviser on heavy machine tools to the U. S. Navy, Bureau of Ships. He was a member of the Union League.

ROBERT E. THAYER, vice-president and a director of the Simmons-Boardman Publishing Corporation, died suddenly on February 25. Mr. Thayer was born in Chelsea, Mass., on August 4, 1883. After graduation from the Massachusetts Institute of Technology he became a special apprentice with the American Locomotive Company, later was an instructor for two years at M.I.T., and a draftsman for one year on the Boston & Maine. He became associated with the Simmons-Boardman Publishing Corporation in 1911 as associate editor of the *Railway Age Gazette*. In 1917 he was appointed mechanical department editor of the *Railway Age* and managing editor of the *Railway Mechanical Engineer*, and in 1919, European editor of the *Railway Age*, with headquarters at London, England. On his return to this country in 1922 he was transferred to the sales department. In 1929 he became business manager of the *Railway Mechanical Engineer* a position he held until 1947. In 1937 he was elected a vice-president of the company. He was business manager of the Locomotive Cyclopedia

Robert E. Thayer

and the Car Builders' Cyclopedia, published by the Simmons-Boardman Publishing Corporation. He was a member of the American Society of Mechanical Engineers.

DAVID W. LAMOREAUX, president of Peerless Equipment Company, died at St. Luke's hospital in Chicago on January 1, at the age of 66. Mr. Lamoreaux began his career in the railroad field in the mechanical department of the Wheeling & Lake Erie. Subsequently he was associ-

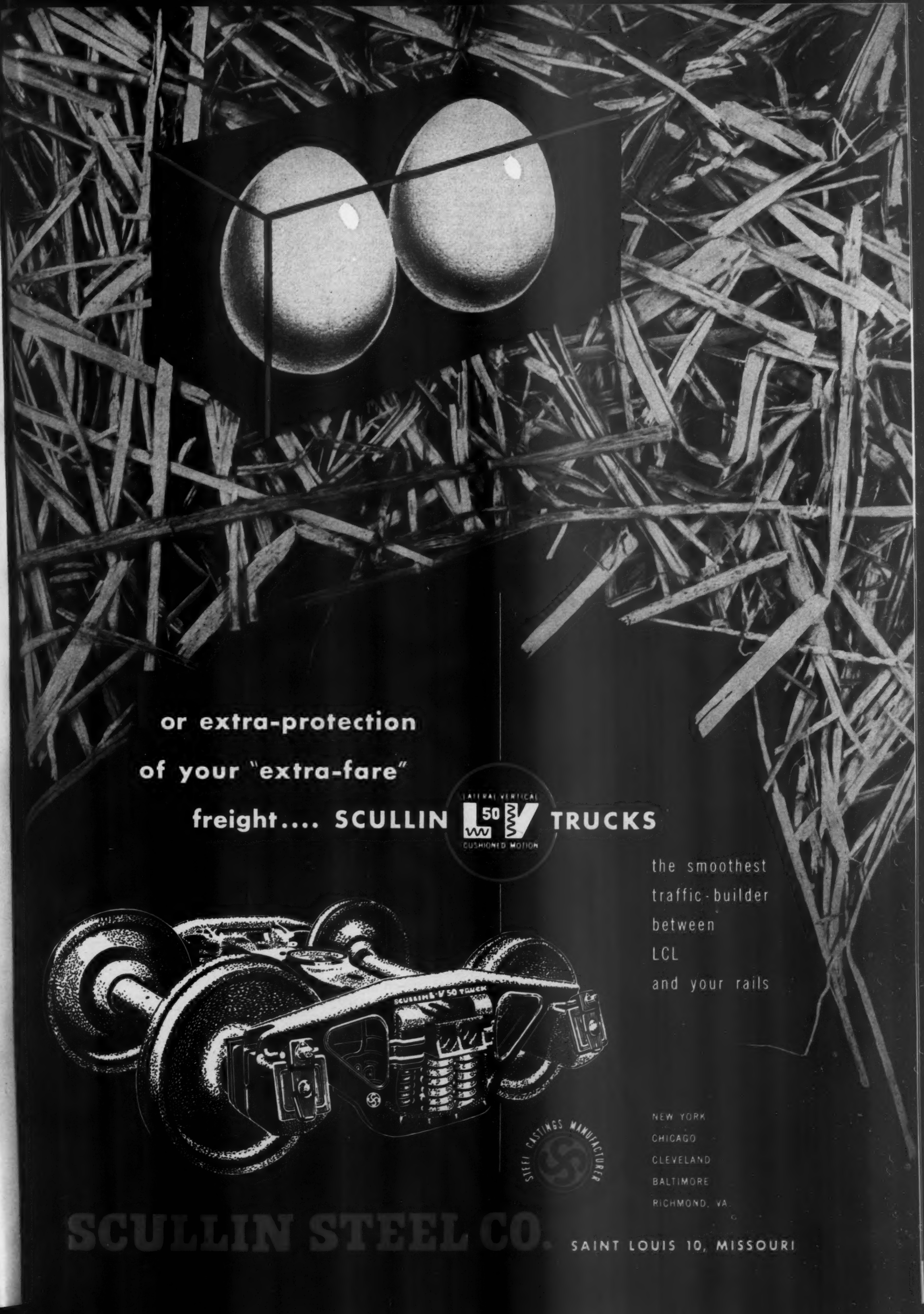
David W. Lamoreaux

ated with the National Refining Company, and later with the Journal Box Servicing Corporation of Indianapolis, Ind. In June, 1937, he became president of Peerless Equipment Company.

JOHN P. HOELZEL, president of the Pittsburgh Screw & Bolt Corp., died at his home in Pittsburgh, Pa., on December 26. He was 67 years old.

HARRY HANSON, vice-president and secretary of the Griffin Wheel Company, died at Chicago on January 12, after 48 years service with that company.

ANDREW W. MACLEAN, vice-president of the MacLean-Fogg Lock Nut Company, Chicago, died on January 28 at St. Louis, Mo. Mr. MacLean was born in 1890 at Chicago and had been associated with MacLean-Fogg since 1928. He entered the company's service at Chicago and in 1934 moved to St. Louis, where he resided until his death.



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of your "extra-fare"
freight.... SCULLIN L-V 50 TRUCKS
LATERAL VERTICAL
CUSHIONED MOTION
the smoothest
traffic-builder
between
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and your rails
STEEL CASTINGS MANUFACTURER
NEW YORK
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BALTIMORE
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PERSONAL MENTION

General

Warren P. Hartman, whose appointment as assistant general manager of the Atchison, Topeka & Santa Fe System's mechanical department, with headquarters at Chicago, was reported in the January issue, was born at Longmont, Colo., on February 1, 1891. He received his B. S. degree in mechanical engineering from the University of Colorado in 1914. He then entered the employ of the Santa Fe as a special apprentice at La Junta, Colo. Advancing steadily in the mechanical department, he served as apprentice instructor and erecting foreman at La Junta and Raton, N. M., and was appointed enginehouse foreman at Raton in 1921. He was appointed general foreman at Albuquerque, N. M., in 1923; transferred to Amarillo, Tex., as fuel supervisor in 1931, and promoted to master mechanic at Slaton, Tex., in 1934. Mr. Hartman was transferred to Argentine, Kan., three years later, and was appointed to mechanical superintendent at Topeka, Kan., in 1941. He became mechanical superintendent of the Coast Lines at Los Angeles, Cal., in July, 1943.

Warren P. Hartman

Frank J. Kossuth, assistant superintendent of equipment, Lines East, of the New York Central, has been appointed assistant to general superintendent of equipment of the system, with headquarters at New York.

Thomas T. Blickle, whose appointment as mechanical superintendent of the Atchison, Topeka & Santa Fe's Coast Lines with headquarters at Los Angeles, Cal., appeared in the January issue, was born on May 12, 1909 at Rochester, Minn. He entered Santa Fe service as a shop apprentice at Ft. Madison, Iowa, in 1927. After completing his machinist apprenticeship in 1931, Mr. Bickle served as stationary fireman and stationary engineer at Chicago until 1936, when he became a machinist at the 18th Street diesel shops. He was appointed diesel maintainer at Chicago six months later; assistant supervisor of diesel engines in 1941; supervisor of diesel engines at Chicago in July, 1942, and master mechanic at Dodge City, Kan., in March, 1947. He was transferred back to Chicago in September, 1949, as mechanical assistant.

T. T. Blickle

William H. Elsner, for the past 20 years mechanical engineer of the Great Northern at St. Paul, Minn., has retired. Mr. Elsner became a draftsman for the Great Northern in 1910 and was subsequently chief draftsman and assistant mechanical engineer. Previous to 1910 he had been employed by the Northern Pacific; the Chicago & Alton (now the Gulf, Mobile & Ohio); the Pressed Steel Car Company at McKees Rocks, Pa.; the Chicago & North Western at Chicago, and the Pullman Car & Manufacturing Co. at Chicago.

William H. Elsner

H. G. Dugan, master mechanic of the Toledo Terminal at Toledo, Ohio, has been appointed superintendent of operations and motive power. The position of master mechanic has been abolished.

Henry L. Bonstein, mechanical engineer of the Lehigh Valley at Sayre, Pa., has retired after 50 years of service with that road. Mr. Bonstein began his career at South Easton as a draftsman in the en-

LOCOMOTIVE MAINTENANCE METHODS

L&N

selects PENNSALT CLEANER after "in use" tests prove: Time saved, costs lowered!

When "Old Reliable"—the L & N—needed a cleaner for use in lye vat operations, they proceeded with typical thoroughness in making their selection:

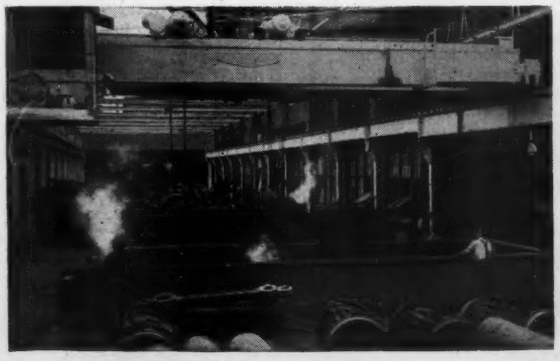
Rigidly controlled tests were run in their South Louisville shops. These tests covered many cleaning cycles over a six-month period.

RESULT: A Pennsalt Cleaner was selected for exclusive use in locomotive parts maintenance.

The L & N found that the Pennsalt Cleaner cut cleaning time substantially. What's more, real economies were realized: Vat solutions of Pennsalt Cleaner lasted longer than other cleaners . . . a worth while saving when dealing with 20,000 gallon vats.

The Pennsalt representative in your locality will be glad to study your maintenance cleaning operations—help you set up tests to determine the most economical methods. Write to Maintenance Chemicals Dept., Pennsylvania Salt Manufacturing Company, Philadelphia 7, Pa.

Progressive Chemistry
for over a Century



(Left) General view of South Louisville Shops of Louisville & Nashville Railroad.
(Right) Locomotive parts being lowered into tank of Pennsalt Cleaner solution.

PENN SALT

railroad maintenance cleaners

gineering department of the L.V. He was chief draftsman before becoming mechanical engineer in 1938. Mr. Bonstein subsequently supervised the L.V. maintenance of equipment department and was responsible for the designing of all equipment.

M. C. SHARP, superintendent of automotive equipment of the Chicago, Rock Island & Pacific, has been appointed assistant to the general superintendent of motive power, with headquarters in Chicago.

W. C. MILLER, chief draftsman in the mechanical department of the Great Northern at St. Paul, Minn., has been appointed mechanical engineer with headquarters at St. Paul. Mr. Miller entered the service of the G. N. in 1918 as draftsman, and has been chief draftsman for 10 years.

B. J. MAGUIRE has been appointed assistant to superintendent motive power of the Chicago, Milwaukee, St. Paul & Pacific, with headquarters at Milwaukee, Wis.

JOHN A. BROSSART, assistant to general superintendent of equipment, of the New York Central System at New York, has retired after 47 years with the company.

C. H. GRAY, assistant shop superintendent of the Chicago, Rock Island & Pacific at Silvis, Ill., has been appointed superintendent of automotive equipment, with headquarters in El Reno, Okla. Mr. Gray will have jurisdiction over the second mechanical district of the road, which comprises the Missouri-Kansas, Pan Handle, Oklahoma, Southern, and Arkansas divisions.

GEORGE H. MASSY, superintendent of motive power and rolling equipment of the New Jersey Central at Elizabethport, N. J., has been appointed superintendent of floating equipment at Jersey City, N. J.

HENRY P. MACDONALD, chief draftsman of the Lehigh Valley, has been appointed mechanical engineer, with headquarters as before at Sayre, Pa. Mr. MacDonald was born at Newton, N. J., and entered the service of the L.V. at South Easton, Pa., as a machinist apprentice in 1923. He later later served as draftsman at Bethlehem, Pa., and Sayre and was appointed chief draftsman at the latter point on April 1, 1948.

T. R. SMITH, diesel supervisor of the Chicago, Rock Island & Pacific at Chicago, has been appointed superintendent of automotive equipment, with headquarters at Chicago. Mr. Smith will have charge over the first mechanical district of the Rock Island, which comprises the Chicago, Rock Island, Cedar Rapids, Des Moines and Western divisions, and Trenton, Mo.

HENRY E. WHITENER, master mechanic at the Communipow engine terminal of the Jersey Central Lines, Jersey City, N. J., has been appointed superintendent of motive power and rolling equipment at Elizabethport, N. J.

Car Department

GEORGE E. MCCOY, assistant chief of car equipment of the Canadian National at Montreal, Que., has retired under the pension rules of the company. Mr. McCoy was born at Moncton, N. B., and entered railroad service in 1900 as mechanical draftsman apprentice with the Intercolonial (now C. N.), becoming draftsman in 1905. In 1914 he was appointed assistant chief draftsman of the Canadian Government Railways (now C. N.), and in 1916 became assistant master car builder. Mr. McCoy was appointed master car builder of the eastern lines of the C. N. in 1918, superintendent of car equipment of the Atlantic region in 1923, general superintendent car equipment of the same region at Moncton in 1928, assistant general superintendent car equipment of the Central region at Toronto, Ont., in 1932, and assistant chief of car equipment of the system at Montreal in 1943.

F. J. KOSSUTH, assistant superintendent equipment of the New York Central, Lines Buffalo and East, has been appointed assistant to general superintendent equipment—car, with headquarters as before at New York.

H. J. YOUNG, general foreman, passenger-car department of the New York Central at Beech Grove, Ind., has been appointed superintendent of the Beech Grove car shop.

P. F. SPANGLER, assistant superintendent motive power of the St. Louis-San Francisco, has been appointed superintendent car department, with headquarters at Springfield, Mo.

Shop and Enginehouse

FRANK A. LONGO, general boiler inspector of the Southern Pacific at San Francisco Cal., has been appointed general welding and boiler inspector, with headquarters at San Francisco. Mr. Longo's duties will include the inspection of welding methods, practices and equipment in motive power and car department, as well as those of general boiler inspector.

GUS FERTAKOS, day general foreman of the Central of New Jersey, has been appointed master mechanic at the Communipaw engine terminal, Jersey City, N. J.

F. W. WILBOURNE, shop inspector of the Norfolk & Western at Crewe, Va., has been appointed gang foreman at the Petersburg, Va., shop.

E. H. WRIGHT has been appointed general foreman of the New York Central at Elkhart, Ind.

Obituary

H. A. SJOGREN, assistant to superintendent car department of the Chicago, Milwaukee, St. Paul & Pacific, at Milwaukee. Wis., died on January 7 at his home in that city.